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ABSTRACT

This volume contains one paper defining the initial operating parameters of the Research and Development Exchange (RDx) and four of a series of papers contracted for the program. The overview paper touches on a variety of topics of continuing concern: the general problems toward which the RDx effort is directed, understandings affecting the design of the work, specific problems being addressed by the RDx goals and objectives, principles guiding the work, and examples of current activities. The first of the contracted papers presents a marketing approach to developing and disseminating educational products. The second paper argues that maximum impact and utility of the RDx effort can be achieved only if there is a balance between the needs and interests of potential clients on one hand and the services provided by RDx on the other. The third paper discusses knowledge production and utilization models, concentrating on understanding how they are affected by who creates them and what assumptions are made, and discusses RDx from the standpoint of the most comprehensive models. It also makes recommendations based on this analysis. The last contract paper discusses interorganization relations problems in the design and implementation of the RDx program. (Author/IRT)

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Conceptual And Implementation Issues Of A Regionally-Based Nationwide System

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December 1977

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Edited by:
Michael Radnor
Durward Hofler
Robert Rich

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PART TWO

INFORMATION DISSEMINATION
AND EXCHANGE
FOR EDUCATIONAL INNOVATIONS:
Conceptual and Implementation Issues of a Regionally-Based Nationwide System

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Part 2

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CHAPTER SIX

A MARKETING APPROACH TO THE DEVELOPMENT AND DISSEMINATION OF EDUCATIONAL PRODUCTS

December, 1977

Northwestern University

Philip Kotler
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INTRODUCTION

In an effort to improve research, development, and dissemination of educational products, the National Institute of Education (NIE) appears to have adopted a change agent philosophy. Discussions to date seem to concentrate on providing more contact between users and change agents, on enhancing initial acceptance, and on fostering contact between users, as a basis for facilitating natural diffusion. Moreover, there appears to be an emerging consensus that what is necessary to make the change agent advocacy approach work is to provide better mechanisms to facilitate user evaluation of products. Along these lines, future change agent efforts would emphasize user meetings and check lists and other materials which users could measure products against.

From a marketing perspective these attempts to shore up the change agent advocacy approach do not seem likely to yield any great improvement. They are still basically an attempt to put the responsibility for educational products on the user system. But the problem is not user sophistication or linkages. The problem is that educational products are not responsive to user needs. The solution is to embed the R&D process in a marketing designed organization which pursues a marketing philosophy.

It is appropriate to consider a marketing approach to educational exchange, because marketing entails performing those activities which facilitate the exchange process. More specifically, marketing activities revolve around identifying marketing opportunities and coordinating the marketing instruments under the manager's control to convert opportunities into product implementation. By performing these activities in a systematic way, the likelihood of achieving the goals of the various parties involved in the educational exchange process is greatly increased; product users are provided the means to improve the quality of their teaching and product developers recoup their investment - whether this return is measured in dollars, satisfaction, the efficacy of the educational experience, or some other criterion.

The purpose of this paper is to present a marketing approach to developing and disseminating educational products. To this end, the report is divided into three sections. In Part I alternative approaches to facilitating the exchange process are examined. Emerging from this discussion is the thesis that it is now appropriate for educational exchange systems to adopt the marketing concept. Part II identifies the tasks or activities that must be performed in order to operationalize marketing functions. For each activity identified, a detailed discussion of how it may be accomplished is presented. In Part III, the organizational structures that may be developed to facilitate the performance of marketing activities are identified.

I. Alternative Views of the Exchange Process

A variety of different philosophies may be employed to guide the development of educational exchange systems. In this section, we shall characterize the marketing approach to educational exchange and identify those features which distinguish it from the approach currently being pursued by the National Institute of Education. First, differences between the marketing approach and other philosophies of exchange are discussed. This entails identifying distinguishing characteristics of different exchange philosophies and demonstrating the relative effectiveness of these approaches in facilitating exchange. On the basis of this analysis, the activities which are essential to effective educational exchange are identified.

Approaches to the Exchange Process

Production. There are several approaches or philosophies available to facilitate the exchange process. One entails adopting a production orientation. When a production orientation is adopted, substantial R&D expenditures are allocated to producing "a better mousetrap." This orientation usually results in the availability of a wide range of products. A production philosophy guided the marketing efforts of the Office of Education during the 1950's and 1960's. Consistent with this orientation, resources were allocated primarily to research and development as opposed to product dissemination activities. The underlying assumption was that the production of new educational products that were superior to existing ones would essentially sell themselves.

Sales. When the failure to gain widespread new product acceptance and utilization indicated that there was little merit in the production philosophy, a sales orientation was adopted. With the establishment of NIE, focus centered not only on developing new educational products, but also insuring their dissemination by requiring that substantial resources be allocated to this task. The hope was that a strong advocacy by various laboratories, centers and Title III demonstration centers would enhance new product adoption and implementation. This hope failed to materialize. Indeed the rate of acceptance of new educational products when the sales orientation was employed was not appreciably different than that experienced when the production orientation had been the dominant philosophy of marketing.

Change Agent Advocacy. In large measure, the failure of the sales orientation was attributed to the inappropriateness of advocacy by producers and other sellers in an educational context. A consensus developed that the role of dissemination could not be to advocate products, many of which might be of low quality. It made more sense to present users with information about products and to demonstrate the products, but not to advocate the products explicitly. The responsibility for actually choosing a product was placed on the user. The change agent advocacy philosophy seems to have provided a convenient rationale for this approach. It provides justification that the role of dissemination should be to make products accessible to those who are most disposed to adopting them. The final adoption level should be left up to the user system itself.

. The adoption of a change agent advocacy approach in marketing education R&D products essentially meant providing tools to users. No attempt is made to directly effect educational improvements; rather the strategy is to make available tools which, if accepted, will themselves foster change. The tool is what is important, not the user. This approach in its most basic form is the agricultural extension model. In this model, R&D efforts result in miracle products which are truly "innovations" or at least are clearly superior to existing products. The problem for dissemination is to get these products, which by definition are "different" from what people are used to, accepted. The extension model assumes that users are ignorant with respect to the product, and perhaps in a more general sense as well, and that they have an inherent bias against change. The solution is to establish direct personal contact with the user. Initially this contact should be with users who are most receptive to change. The purpose of this contact is to create acceptance by demonstrating to the individual that the product yields clear benefits for him or her. The focus of the extension model is thus on showing the individual that the tool works.

Once the tool has been accepted by some number of people, who are usually thought to be elite, it should, according to the extension model, diffuse through the social system to other people. The early adopters should be influential enough to create acceptance by other people in much the same way that their acceptance was created by the agent. The agent needs only to reinforce this process by making sure that the product and relevant information are available. The dominant force for change arises through the natural interaction of people.

The agents are only a catalyst in the process. They do not produce change. They introduce the conditions for change.

The change agent philosophy which has evolved in education, of course, goes beyond the basic agricultural extension model. But the assumptions remain much the same. Change agent advocacy in education holds that users should be offered a wide variety of R&D products. There should be no explicit advocacy of these products. The advocacy should rather be implicit. Information about products should be made available, and, if possible, the product should be demonstrated to some users (hence the heavy influence of demonstration projects). Once this is accomplished, other users will be convinced that the products are useful and will be able to select those which are best suited for them.

Adoption of the products should proceed according to the classic, extension model pattern for innovations. The early adopters are those who are most knowledgeable or receptive and for whom the product is best suited. These individuals pass on their positive experience directly to other potential users, thereby influencing others to adopt the product as well. There is a snowballing effect in which the evaluations of early adopters and their communicative behavior play a key role.

The evidence available to date appears to question the efficacy of the change agent advocacy approach in educational settings. Indeed, a recent evaluation study by the Office of Education, Project LONGSTEP, documents the absence of any clear impact from educational "innovations." The study covered about 30,000 students in grades one through twelve. The students were drawn from thirteen diverse school districts in nine states. A longitudinal design was employed; the students were studied over a four-year period. The products covered included team teaching, teacher development materials, multimedia, flexibility in classroom structure, and individualized instruction. The study concluded that student growth was not correlated with adoption by the user system of these "innovative" products. If anything, the evidence seemed to indicate that an emphasis on such products might be associated with moderate rather than high student development.

From our perspective, evidence such as this points to a clear breakdown in the applicability of the agricultural extension model's assumptions to education. Few, if any, products of educational R&D have a dramatic impact, let alone an impact that will be clearly visible and beneficial to the immediate user. Therefore, there is no reason to believe that merely exposing users to these products, that is, making the products accessible, will lead to acceptance, even by so-called innovators, simply on the basis of the demonstrable superiority of the products. And without this initial acceptance there is certainly no reason to expect the products to diffuse through the user system.

Attempting to put the responsibility for acceptance of products on the user system may help contain criticism of educational R&D. It is not likely to yield higher usage rates or, in itself, user satisfaction. This is because the change agent philosophy, as it has evolved in education, fails to consider the needs of product users as the impetus for R&D activity. Rather, it relies on the assumption that superior products will emerge spontaneously -- an assumption that is yet to be borne out.

Marketing. A more compelling approach to the dissemination of educational products entails adopting the marketing concept. The marketing concept is not so much incompatible with the change agent advocacy approach as it is a step beyond it. The marketing concept recognizes the importance of product features, of early users of a product, and of the growth curve, life cycle diffusion of a product. But such considerations are not the prime movers in designing a marketing system. The prime mover is the needs of the user. Once a systematic approach has been established to identify user needs and to translate these needs into educational products, it becomes appropriate to consider the efficacy of a change agent advocacy.

Marketing takes the focus off the product and puts it on the user's needs. Products are developed from the user's point of view, not the producer's. There is certainly room for creative ideas and innovations in the marketing system. The user's need for a product may only be latent. The user may not be able to even conceive of the product much less express a desire for it. Even in the case of latent needs, however, beyond the initial stage of invention, the R&D process must be guided by user considerations. A product may originate in completely basic research, but from initial idea onward it is developed with the user in mind. Less original products are expected to develop directly from user needs. The guiding principle of marketing organization is that all activities flow from the consumer. The system is user driven.

It might be argued that a change agent system is also user driven. This is true only in the sense that the user is making the final evaluation and decision. The product is still being directed at the user. Perhaps the product is being directed less forcefully than with other versions of the sales concept, but it is being directed nonetheless from the producer's point of view. The marketing system is user driven in the sense that it is the user's needs, latent or manifest, that provide the direction.

It is not sufficient merely to advocate change by making products available and then expect the user to be able to effect change by sifting through and evaluating the large variety of products made available. There is no evidence that users have this capability. It is not part of their jobs; they have not been trained to review R&D products; they have probably grown skeptical of the educational R&D establishment. While the change agent advocacy view of the user may make sense for a miracle product, given the types of educational R&D products which are in fact turned out, it is quite doubtful that the typical user reacts in anything like the way he or she is portrayed. The user almost certainly does not act in such a way as to guide the entire R&D system by his evaluations.

On the other hand, there are strong signs that users do have definite needs that could be satisfied by the R&D system. Existing products do not seem to be strongly linked to these needs. A good example indicating the existence of unfilled needs is the publication of "Zephyros," a non-profit West Coast magazine that has perhaps reached almost 50,000 teachers at $2.50 per issue. The magazine is based on ideas that teachers send in which they have developed for use in their classroom. The material may be in the form of letters, drawings, or mimeographed sheets. It is pasted together and printed as a catalog. Apparently, many teachers find the material useful. This is not surprising. If a need exists for one teacher, it is likely that a similar need exists for another. That such a simple catalog could be successful, however, in the face of the competing volume of professional R&D products, strongly suggests that the R&D products are not as sensitive to the user's needs as they might be. Although there appears to be little research which would allow us to be specific about what these needs are, this is just one example of the anecdotal evidence that unmet needs do exist.

The existence of unfilled needs does not imply that the user will be responsive to change agent advocacy. The user is oriented to the school system, the school, and the classroom, not to the external environment. There is little reason to expect the user to sift through and evaluate an assortment of products, on the possibility that there may be one that does fill a need. This is just not compatible with the user's orientation. The existence of unfilled needs does imply that the user will be responsive to the marketing approach. The marketing approach seeks to develop products out of unmet needs, thereby ensuring responsiveness.

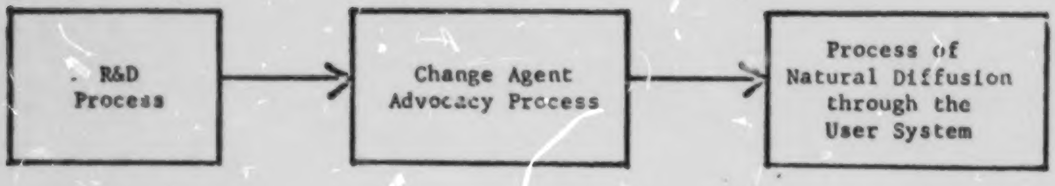
The general design of a marketing system for educational R&D is shown in Exhibit 1, and follows directly from the points we have made. Contrasted with the general marketing design in Exhibit 1 is the change agent design. Note that the change agent design begins with the R&D process. A product is created, undergoes change agent advocacy, and then is diffused through the user system. This last process, however, is outside the control of the organization which has developed the product. It is left, as has been indicated, to natural forces within the user system.

The general marketing design, however, does not begin with the R&D process. Moreover, it carries the product far beyond the R&D process. The objective is in fact to embed the R&D process within the organization so that it is entirely responsive to user needs. All products, even those stemming from basic research, are developed in the context of an analysis of the needs of a particular group of users. These needs define the market. The market shapes the product. The market analysis process attempts to ensure that the R&D process fully considers user needs. Once a product has been developed, it still must be subjected to the strategic marketing process which seeks to tailor the product even further to user needs. All aspects of the product (price, etc.) are considered in this process.

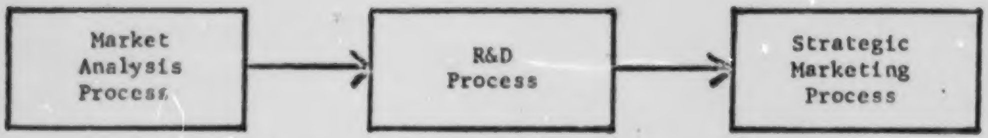
In understanding how this general design could be implemented, it is useful to indicate how the marketing tasks (described in Part II) fit into the market analysis process and the strategic marketing process. Both of these processes can best be understood as the sequential implementation of the building block tasks we have already discussed.

A flow diagram of the market analysis process is shown in Exhibit 2. The

Exhibit 1

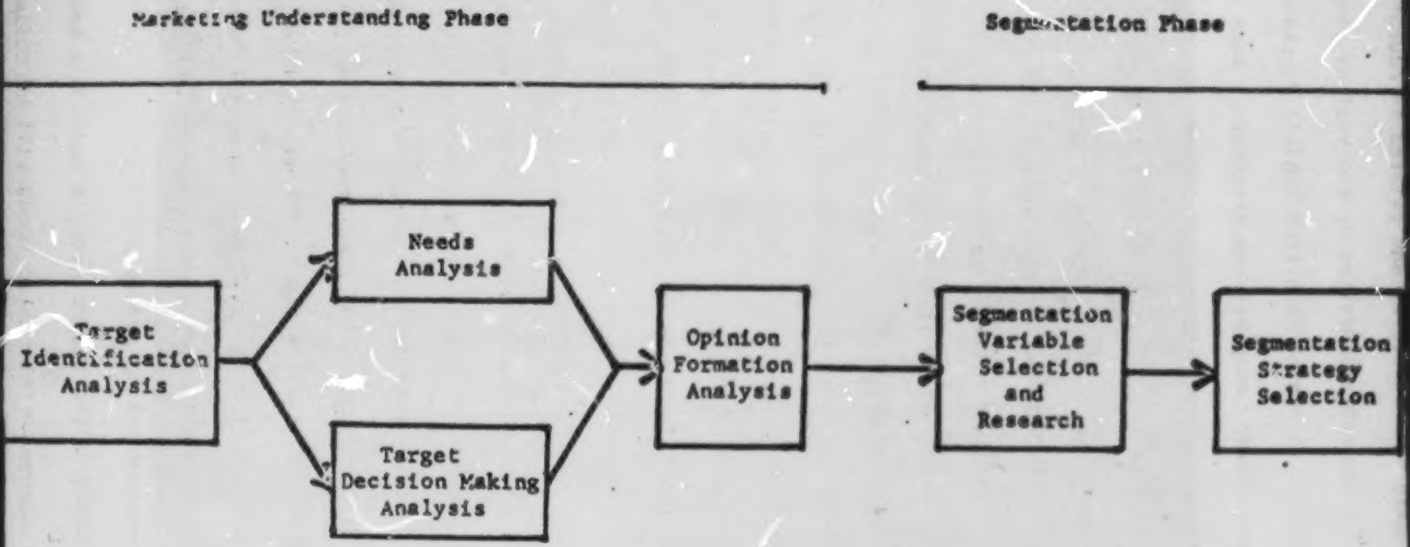

R&D Process
Change Agent Advocacy Process
Process of Natural Diffusion through the User System

Change Agent Design


Market Analysis Process
R&D Process
Strategic Marketing Process

General Marketing Design

Exhibit 2


Marketing Understanding Phase
Segmentation Phase
Target Identification Analysis
Needs Analysis
Target Decision Making Analysis
Opinion Formation Analysis
Segmentation Variable Selection and Research
Segmentation Strategy Selection

The Market Analysis Process

building block tasks have been described and related to education in Part II. The emphasis here is on the interconnection of the various tasks to form an organizational structure. As can be seen from Exhibit 2, the market analysis process basically has a linear, step-by-step structure. Each task takes the previous one as an input.

The process begins with the identification of target users. Any number of considerations may come into play here, such as long run objectives, current crises which may be affecting the educational system, the desire to help previously disadvantaged users, and breakthrough product ideas. The task is to draw together these considerations, whatever they are and wherever they come from, and to specify their implications, not for a product, but for the group of users to which the organization wishes to be responsive. The more limiting the relevant considerations are, the more narrowly defined will be the target group. But the point is that these considerations must be analyzed up front and used to define the group of people for whom the marketing approach is to be built.

The next two tasks are performed in parallel, as indicated in Exhibit 2. Once a target group has been identified, an attempt is made, usually entailing research, to determine the unmet needs of this group. Since the expression of these needs will be channeled through the decision-making structure of the user organization, this structure must be analyzed simultaneously with the needs analysis. It is necessary to understand how the individual user's needs interact with those of other people in the user system. It cannot be assumed that the needs of the target group are simply the sum of the needs of the individuals making up the group. Needs must be analyzed in the context of the user decision making process.

Once an understanding of the target group's needs has been achieved, it is still necessary to determine how these needs will be reflected in actual opinions. The existence of a need within the target group does not necessarily imply receptive opinions and behaviors. It is important to diagnose how these opinions and behaviors may block or facilitate satisfaction of the underlying need.

The result of the marketing understanding phase is to achieve a thorough understanding of the target group. Based on this understanding, the segmentation phase addresses the key question of whether the target group can be satisfied most effectively as a group or as subgroups. From the understanding achieved of the target group, segmentation variables are selected which represent the major differences within the target group. As this point the market analysis process must begin to focus on the set of needs which may be satisfiable. Segmentation variables are selected for each need. Research is then necessary to confirm that users do in fact differ in terms of the variables selected. Finally, the segments derived for each need must be examined in terms of the organization's resources and objectives in order to determine if it is worth treating each as a separate target group.

This then is the market analysis process: a step-by-step implementation of the building block tasks. What is important to recognize is that the output of this process supplies strict guidance to the R&D process. R&D receives criteria for what the product must do and the variations it must have to satisfy optimally different segments of users. Various other characteristics of the user segments in the form of opinions and behaviors that may affect usage of the product are available to guide development.

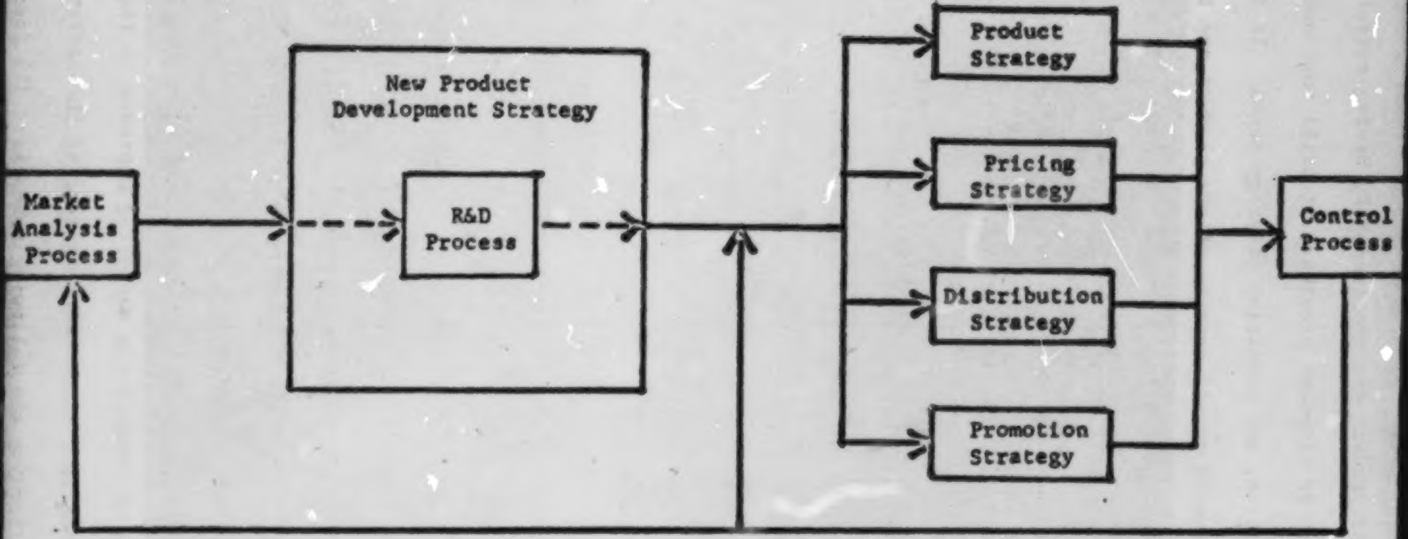
There is no possibility after the market analysis process for R&D to make a product without fully considering the user. No product which does not relate to a specific need of a user segment will be developed. Unlike the change agent advocacy design, which begins with the R&D process (see Exhibit 1), products do not come out of R&D to be directed at possible users. They are directed by the user, via the market analysis process, through the R&D process.

It is important to note that the market analysis process, by design, will function to limit the quantity of products coming out of R&D. Because each product must receive more attention, educational R&D would tend to turn out substantially fewer products if redesigned following the marketing approach. But these products should be of superior quality from the point of view of users.

A flow diagram of the strategic marketing process is shown in Exhibit 3 in the context of the general marketing design which we are proposing. Unlike the market analysis process, tasks within the strategic marketing process are not in general arranged in a step-by-step task sequence. This organizational structure follows from the fact that the goal of this process is to integrate all aspects of the product in order to achieve truly optimal user satisfaction. Once R&D has developed a product, all the decisions related to getting that product to the user are considered from the standpoint of user satisfaction.

The most important feature to notice in Exhibit 3 is that the R&D process has itself become a part of a larger strategic effort, termed new product development. Even with the input from the market analysis process, the R&D process is not allowed to function without direct feedback from the consumer. The various steps of concept development, screening, and test marketing (cf. Exhibit 6) are all designed to relate the product back to the user while it is still in the R&D process. If at any point the product does not measure up to the input criteria of the market analysis process, the R&D process must start over again. If test marketing indicates that the developing product does not fulfill the user need in the way prescribed by the market analysis process, or if the product runs into some new obstacle not anticipated in the earlier process, this user

Exhibit 3


New Product
Development Strategy
Market
Analysis
Process
R&D
Process
Product
Strategy
Pricing
Strategy
Distribution
Strategy
Promotion
Strategy
Control
Process

The Strategic Marketing Process in the Marketing Design feedback must be taken into account before development work proceeds.

Even when the product emerges from R&D, having satisfied the requirements of the new product development strategy, it still must undergo the product, pricing, distribution, and promotion strategy tasks. It is assumed that the user ultimately reacts to all aspects of the product and that these must be adjusted to optimal satisfaction as well. Hence, it is necessary to examine the relationship of the product, from the user's point of view, to other related products being produced by the organization. Again, the idea is to integrate all these strategic elements into the best product possible for the target segment.

The final provision in the marketing design in Exhibit 3 is for a control process which has been implicit in our discussion so far. The marketing approach clearly dictates that the user's satisfaction with the final product be monitored over time for changes. If changes are detected, depending on their degree, they are fed back to reinitiate the strategy tasks or the market analysis process itself.

II. Educational Marketing Tasks

In the previous section, we identified the tasks required to operationalize the marketing concept. Now we shall focus our discussion on elaborating what is involved in performing the tasks identified in an educational context. Specifically, three tasks are: (1) understanding the market, (2) segmenting or dividing the market in accord with product users' needs, and (3) orchestrating marketing instruments to satisfy users' needs.

Task 1: Understanding the Market for Educational Innovations

Fundamental to employing a marketing approach to the diffusion of educational innovations is a clear understanding of the market for these innovations. This entails performing the following subtasks: (1) identification of the target market; (2) analysis of target market needs; (3) assessment of the decision-making process employed by the target. Each of these subtasks is discussed in the following sections.

Target Market Identification

The initial step in target market identification is the specification of all parties who are likely to be influenced by the adoption and implementation of the educational innovation of interest. For example, when the University of Wisconsin was attempting to gain adoption of a multiunit elementary school(MES) focus centered not only on the individual or organization which made the adoption decision, such as the local school board, but also with other parties affected by the adoption of MES. These parties included state educational agencies, elementary school administrators, teachers, students and parents. The important point is that target market identification must entail specification of all concerned parties since successful diffusion of an innovation requires that the needs of all these parties be considered. Furthermore, the relative importance of the various parties in the adoption process may vary according to the nature of the innovation, and the greatest emphasis should be given to the needs of those parties most directly affected by the innovation.

Need Analysis

Once the target market has been identified, a need analysis must be conducted for each of the parties in the target. The first step in a need analysis is specifying the needs of the targets in detail. It often entails an examination of archival data. These data include: student performance on tests measuring specific skills, records of successful and unsuccessful attempts to diffuse previous educational innovations, teachers' budgetary allocations designated for particular purposes, data collected as part of previous research, and records of requests for various educational materials.

There are specific reasons for collecting each of these types of data. Student performance on tests measuring reading, math and verbal skills could be examined to identify areas where performance is poor. This might indicate a need for more effective teaching methods and tools in these areas. Records of previous attempts to diffuse educational innovations could also be examined to generate insight regarding target needs. The needs fulfilled by innovations which were successful might be contrasted with the needs served by ones which failed to obtain some notion about the importance of these various needs. In addition, any systematic efforts to determine the reasons why a particular innovation failed to gain acceptance may also provide insight into needs. Teachers' budgetary allocations to particular areas may provide an indication of their needs for supplementary teaching materials. Existing literature and data collected as part of previous research projects might also be examined for clues regarding the needs of the target. This might include the focal organization's own research as well as research conducted by other organizations such as universities, regional centers and labs, SEAs and LEAs. Finally, valuable information regarding target needs may be obtained by simply examining the requests for materials and information which are made at all levels in the educational system. For example, requests which teachers make to their school administrators, LEAs and SEAs regarding desired information and materials provide an indication of their needs.

After archival data has been examined, the organization may have some general notion of targets' needs. However, since this information is derived from data collected for some purpose other than need identification, it is likely to be incomplete. As a result, it may be necessary to collect additional data to help define target needs. Two methods exist which could be employed to collect this data: observation and direct questioning of the targets. In some instances, it may be feasible for the organization to draw inferences about target needs by simply observing the target in the educational system. Conclusions about teachers' and/or students' needs might be drawn on the basis of observing teachers' and students' behaviors in the classroom. Alternatively, target groups might be asked to express their needs directly in either informal personal or group interviews or through structured questionnaires.

Once the target's needs have been defined, the organization must assess how well these needs are met by the offerings of other organizations in the educational system. While many needs may be served by the products of these other organizations, some needs will probably be unmet. The focal organization must then determine which of these unmet needs it can address most effectively.

Decision-Making Processes

In addition to identifying the target market and specifying the needs to be served, the organization must understand how the target makes decisions to adopt or reject new products. This decision making involves two processes: (1) the interaction between the various individuals involved in the decision and (2) the development of points of view by the individuals involved in the decision making. Knowledge of both of these processes is basic to facilitating the exchange process.

The Buying Center. The buying center refers to all of the parties involved in the purchasing or adoption of innovations and the roles played by these parties. As we noted in our discussion of target market identification, many individuals other than the actual purchaser of an educational innovation participate in the purchase decision. In fact, there are at least five roles which an individual can play in a purchase decision:

(1) Initiator - The initiator is the person who first suggests the idea to purchase a particular educational innovation.

(2) Influencer - An influencer is a person who explicitly or implicitly carries some influence on the final decision.

(3) Decider - The decider is a person (or persons) who ultimately determines what action should be taken: whether to buy, what to buy, how to buy, when to buy and where to buy.

(4) Purchaser - The purchaser is the person who makes the actual purchase.

(5) User - The user is the person who operates the product or service.

In a particular situation the same individual or group of individuals may play several roles, and several different individuals may play the same role. Furthermore, the individuals or groups who play the various roles may differ across situations. Understanding the roles that different groups or individuals in the target play in the decision to adopt is important because people in different roles may require different types of information about the innovation.

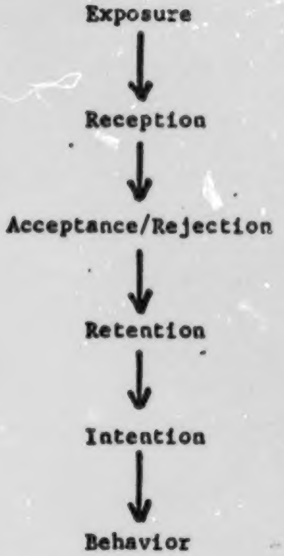
Opinion Formation

Regardless of the role that members of the target market play in the purchase decision, they require information in order to form their opinions. If an organization is to be effective in providing such information, it must have an understanding of how individuals process and utilize information. In this section,we will briefly summarize a model of information processing and identify its implications.

The information processing model is depicted in Exhibit 4. The model interprets behavior as a function of information transmission through several necessary, but not sufficient, stages. Thus, one must be exposed to information before it can be received. Yet, exposure is not sufficient for reception. In turn, given that an individual receives the information, there is some probability that he/she will choose to accept or reject it.

Exhibit 4

INFORMATION PROCESSING MODEL


Exposure
Reception
Acceptance/Rejection
Retention
Intention
Behavior

Further, acceptance or rejection of the information is a necessary, but not sufficient, condition for retention. Finally, information which is retained may influence intention and, ultimately, actual behavior. Let us now examine the model components in more detail.

Exposure to information entails the physical presence of an individual at the time the information is being given. Exposure is a function of two factors: the environment and the utility of the information. An individual's environment controls the information that he/she is aware of and, therefore, exposed to. For example, teachers are likely to read education journals, attend teaching seminars, and associate with other teachers. Thus, if an organization wants to insure that teachers are exposed to information about an educational innovation it must first make them aware of the information by placing it in their environment (i.e., in educational journals, at teaching seminars and conferences, etc.). However, careful placement of the information in the target market's environment will not be sufficient to guarantee exposure. Given awareness of information, an individual may decide to expose himself/herself on the basis of the perceived utility of the information.

The utility of information is a function of two factors: (1) certainty about one's position and (2) decisional importance. Certainty about one's position depends upon the quantity of information (e.g., amount of past information and experience the individual has with respect to the issue), quality of information (e.g., is the information current or out-of-date?), and the consistency of the information (e.g., does all the information support a particular approach, etc.?). When an individual is highly certain about his/her position with respect to a particular issue, he/she may see little utility in additional information and therefore choose not to expose himself/herself to it. The other factor which influences an individual's evaluation of the utility of additional information is the importance of a decision. This factor is related to the economic, social, and physical costs associated with the decision. As these costs increase, the utility of additional information and consequently the probability of exposure to such information increases.

Given that an individual is exposed to information, there is some probability that he will receive the information conveyed. Reception involves the processing and comprehension of information. Individuals are most likely to process information which is salient to them. For example, a teacher who is very concerned about how to teach reading effectively is likely to process information on this topic. If the salience of a topic is low for a particular target it may be increased by linking it to something which has high salience.

Reception is also related to comprehension. An individual's comprehension of information may be enhanced by insuring that the information is communicated simply and clearly. In addition, repetition of information will help insure reception by increasing the probability that the information will be processed and understood.

Once information is received it may undergo further processing by the individual and be either accepted or rejected. The acceptance or rejection of the information is a function of the individual's initial opinion and the effectiveness of the arguments advanced in the communication. If people have a strongly negative predisposition to an innovation, it is unlikely that information will cause a dramatic change in their opinion. Consequently, the organization may wish to exclude such individuals from the target market. In addition, the arguments presented in the communication will influence the acceptance/rejection of the information. The communication will gain greater acceptance if the arguments advanced relate to factors that the target considers important, and if they are substantiated by evidence unfamiliar to message recipients. If information is accepted or rejected there is some probability that it will be retained or stored for further use in forming intentions and behavior. The probability that information will be retained can be enhanced by the use of repetition.

We have now summarized the process by which opinions are formed. However, organizations typically are not concerned about developing favorable opinions toward their products or innovations per se. Rather, they are interested in developing favorable opinions because they believe that these will lead to favorable behaviors (i.e., adoption). While existing research indicates that attitudes are consistently related to behavior, it has also been demonstrated that attitudes are only a partial explanation for people's behavior. Consequently, organizations must be sensitive to other factors which influence behavior. Two factors other than attitudes -- reference groups and unanticipated events -- have a significant impact on behavior. Individuals are often influenced by what they believe that others who are important to them (e.g., family, friends, co-workers, etc.) expect them to do in a particular situation. Therefore, in communicating with the target market the organization should be aware of the importance of these reference groups and attempt to obtain and communicate their support for the product or innovation.

It has also been found that behavior is facilitated or inhibited by unanticipated factors in the environment. For example, a teacher who intends to order materials necessary to employ a particular method of teaching reading may be dissuaded from doing so if he/she discovers that the materials are out-of-stock and will take three weeks to get. On the other hand, a teacher who is uncertain about which type of reading materials to order may be encouraged to order a particular set if he/she discovers that that set is available at a special, low introductory price. The organization must be sensitive to the fact that factors in the environment may either facilitate or inhibit the behavior it desires and therefore it must take steps to maximize the facilitators and eliminate the inhibitors.

In sum, effective marketing of educational products requires an understanding of user needs. In this section, we have outlined a model of how educational decision makers process and use information to make product decisions. This scenario provides a framework for conducting research to identify consumer needs. In turn, by employing this framework for conducting research, it is possible to assess the extent to which a new educational product is likely to meet consumer needs and the reasons for the acceptance of products that have been on the market for some time.

Although the performance of the comprehensive market analysis suggested above is likely to increase the utility of the products developed, it is employed only in isolated cases in educational product marketing. In part, this is attributable to the production and sales orientation that has been adopted by educational-product marketers. In part too, it is due to the fact that the cost of the comprehensive market analysis outlined is prohibitive for a particular developer to perform.

If the marketing efficiency of educational products is to be increased, there must be a reconceptualization of the way market analysis is done. One way to proceed is to assign specific research tasks to particular institutions. Generic research, which addresses what educational decision makers perceive to be major problems and describes how they cope with these problems, would be catalogued and disseminated via some centralized institution such as NIE.

Generic research data would also indicate the extent to which existing products have been disseminated successfully, and the reasons for the observed level of performance. Developers of educational products would be required to justify proposals for R&D work by demonstrating that generic research data is congenial with the product they plan to develop. It would also be necessary for developers to outline reasons for their belief that the proposed R&D work would yield a product that is not already on the shelf.

By requiring developers to use generic research the likelihood of developing high utility educational products is enhanced. However, a second type of market analysis is required. This type, termed product research, should be conducted by the developer. In contrast to generic research, which identifies problems and the adequacy of existing products in resolving these problems, product research focuses on the efficacy of a developers' product in dealing with a specific problem. As an integral part of the R&D effort, developers would conduct research to determine the degree of acceptance of their product and the reasons for the degree of acceptance observed. This information would be used to modify the product or discontinue development work prior to its mass dissemination.

To insure that a product research program is an integral part of the R&D effort, a certain portion of the research funds provided to a developer would have to be allocated to product research. This approach is congenial with NIE's previous practice, though it differs in an important respect. Rather than allocating funds to insure dissemination as was previously done, funds would be alloacted for product research. This would insure that the products developed meet consumer needs prior to their dissemination.

The segregation of research into generic and product components suggested above has several important implications. It enhances the likelihood that new educational products address user problems. It reduces the chances that new products simply duplicate previous R&D efforts. And, it makes market analysis economically feasible. In essence, by following a marketing approach the increased investment in market analysis in relation to current expenditures will be more than offset by the decrease in dissemination expenditures. The overall result is likely to be greater marketing efficiency. However, if this outcome is to materialize, a centralized institution such as NIE is required that effectively gathers and disseminates generic research data.

Task 2: Segmenting the Market

One assumption which could be made about the market for educational innovations is that it is homogeneous; that is, all potential adopters (e.g., schools, teachers, etc.) are essentially the same. However, it is readily apparent that potential adopters differ in many ways which are relevant to new product adoption (e.g., they differ in their needs, attitudes, locations, etc.). Consequently, an organization may find it advantageous to segment the target market into homogeneous subgroups on the basis of characteristics related to product adoption or use, and then employ different marketing programs to serve the needs of these different segments effectively.

Bases for Segmentation

The target for educational innovations may be segmented on the basis of a variety of factors. Of focal concern here are geographic, demographic, and behavioral bases for segmentation.

Geographical segmentation entails segmenting the target market on the basis of location (e.g., area of a city, county, country). This type of segmentation is useful when there are specific geographically induced differences in product use patterns and/or attitudes toward the product.

Demographic segmentation entails subdividing the market on the basis of demographic variables such as age, sex, income, education, and social class. This is one of the most popular bases for segmenting the marketplace, largely because consumer needs and usage rates are often related to demographic variables. Also, demographic factors are easier to measure than other types of segmentation variables.

Behavioral segmentation refers to subdividing the target market on the basis of some relevant behavior. For example, firms often choose to concentrate their efforts on the heavy users of a particular product (i.e., the individual who purchases the product in large quantities and/or frequently). This strategy may be appropriate in educational settings when an organization has limited resources and desires to reach that segment of the market which uses the innovation first.

Having examined bases for segmentation, we need to consider how an organization determines whether or not a segment is attractive. Of course, as we noted in our discussion of target market needs, an organization should focus on segments of the market whose needs are unmet or inadequately met, and whose needs the organization has the expertise to meet. However, simply focusing on segments with unmet needs that the organization can address is not sufficient. In addition, the organization must establish that the target is measurable, accessible, and substantial. Let us consider each of these criteria.

The measurability of a segment refers to the degree to which information exists or is obtainable for a particular buyer characteristic. Unfortunately, many suggestive characteristics are not susceptible to easy measurement. Thus, even though a teacher's classroom style is likely to influence his/her adoption of innovations, this dimension may not be a useful basis for segmentation because it is difficult to measure.

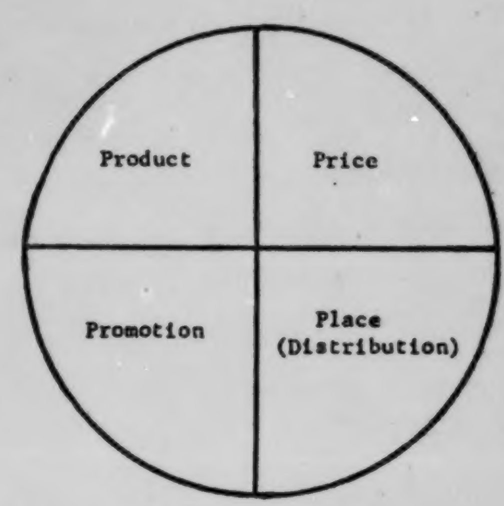
The accessibility of a segment refers to the degree to which an organization can effectively focus its marketing efforts on chosen segments. This is not possible with all segmentation variables. It would be useful if media (e.g., teachers journals) could be found which would only reach, say, innovative teachers, but it is likely that these teachers are exposed to the same media as non-innovative teachers. Consequently, even if innovativeness is related to adoption of new teaching tools it may have little practical value if there is no way of efficiently reaching "innovators."

Finally, to be meaningful a segment should be substantial or large and/or profitable enough to be worth considering for separate marketing cultivation. It may not be worthwhile for an organization to develop a separate product or program for serving the needs of very small segments Although organizations involved in the development of educational innovations may not always be concerned with making a profit, they do have limited resources to spend. Therefore, they must be concerned with whether a particular segment is substantial enough to warrant the allocation of resources necessary to meet its needs. This does not imply that resources should not be spent against small segments. Rather, the point is that the number of people affected should be considered in developing a segmentation strategy.

Task 3: Developing a Marketing Program

In the previous sections, we have discussed the market for educational innovations. After an organization has identified its target market(s) it must then develop a marketing program which will meet the needs of these market(s). This involves decisions about four major factors which are under the organization's control: product, price, distribution or place, and promotion. These factors together are often referred to as the marketing mix (see Exhibit 5).

Exhibit 5



The Marketing Mix

In the following sections we will consider each of the elements of the marketing mix. Although each element is discussed separately, it is important to note that all the decisions regarding the marketing mix are interrelated and are ultimately a function of the target market that the organization is attempting to serve and the needs of that target.

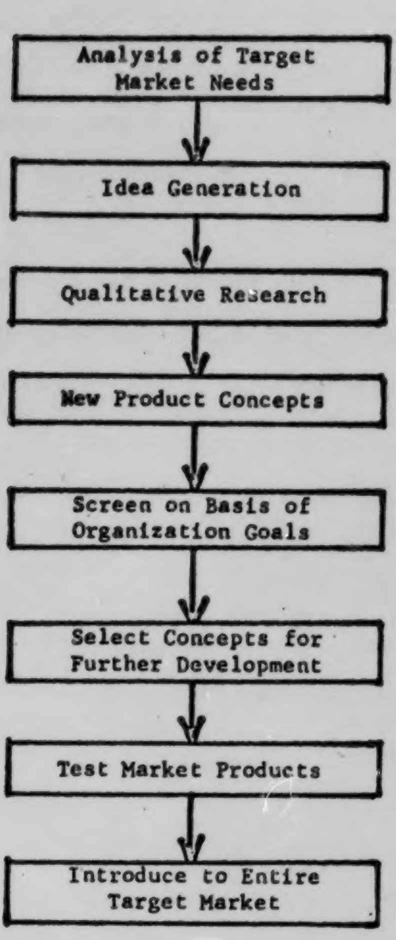
Sub-Task: Product

Two basic issues must be addressed with respect to product: (1) what products or innovations should be offered to the market? and (2) how can trial of these products be encouraged? Each of these issues will be considered in turn.

Establishing the Product line. Determination of what products should be offered to the market typically involves the process summarized in Exhibit 6.

Exhibit 6

New Product Development


Analysis of Target Market Needs
Idea Generation
Qualitative Research
New Product Concepts
Screen on Basis of Organization Goals
Select Concepts for Further Development
Test Market Products
Introduce to Entire Target Market

As the exhibit indicates, new product development should begin with an understanding of the needs of the market. On the basis of this understanding, members of the organization may engage in idea generation regarding products. These ideas may then be screened by using qualitative research techniques with members of the target (e.g., focus group interviews, in-depth interviews, etc.) to assess target (e.g., focus group interviews, in-depth interviews, etc.) to assess how well the new product concepts meet the market's needs. Those concepts which appear to have the potential to meet the market needs may then be evaluated in terms of organization goals and capabilities. Concepts which are compatible with the goals and expertise of the organization undergo further development. Prototypes of these products may be developed and tested. This testing is used to refine the product so that it better meets the needs of the target. Next, the product may be tested in a field setting (test marketed) to check its performance and acceptance under actual usage conditions. In addition, the field test may be used to examine the adequacy of strategies with respect to other elements of the marketing mix, such as price, distribution, and promotion. Finally, if the product performs well in the test market it may be introduced on a broad scale to all target members.

New Product/Innovation Trial. Product adoption is facilitated by gaining trial. In turn, trial is enhanced if the product possesses certain attributes. Rogers (1962) has identified five attributes that influence the rate at which a new product/innovation becomes adopted:

(1) The relative advantage of the new product over existing products. The greater the relative advantage, the more rapid the adoption.

(2) The compatibility of the new product with the lifestyle of members of the target. The more compatible with the target's lifestyle that the new product is, the more rapidly it will be adopted. However, compatibility should not entail developing a product that is highly similar to those in existence.

(3) The complexity of the new product. The more complex the new product, the slower the adoption.

(4) The communicability or extent to which the new product's function and features can be described to someone who has not seen or used the new product.

(5) The divisibility of the product, or the degree to which the product can be tried in small quantities on a limited basis. If a product is divisible this will enhance the probability of adoption.

On the basis of this analysis, it can be seen that products which have a significant relative advantage and are compatible, communicable, and divisible, but not highly complex, will be most rapidly adopted. The effects of these factors can be better understood in terms of the information processing model developed in Task 1 and Exhibit 4. High communicability and low complexity increase adoption because they enhance the probability that information about the product will be received and understood. A significant relative advantage and high compatibility increase the probability of adoption because they enhance the probability that information about the product will be accepted. Finally, divisibility increases product adoption by increasing the probability that trial (behavior) will occur.

Characteristics of the target also influence the rate of product adoption. It has been observed that the adoption process may involve two steps. First, the organization which has developed the product/innovation communicates about it through mass media (e.g., journals, publicity on TV, etc.). The communications reach opinion leaders who, in turn, communicate through word-of-mouth about the innovation to the masses (e.g., the rest of the target market). This process is important because if organizations can identify and focus on these opinion leaders, the opinion leaders will facilitate information dissemination about the innovation, increasing the efficiency of the communication process. While it is often difficult to identify opinion leaders for particular products, since they tend to be like non-opinion leaders only more experienced, it may be possible to use records of past adoptions to obtain an idea of who the opinion leaders are. For example, in educational situations teachers or school systems which have historically adopted educational innovations early in the adoption process might be considered to be opinion leaders.

Sub Task: Price

In this section we shall address several issues related to the pricing of products. First, a number of factors which must be considered when establishing price will be detailed. Then, two general types of pricing strategies will be outlined and the circumstances under which each of these strategies as appropriate will be specified.

Considerations in Setting Price. Typically an organization prices a product with the objective of covering both fixed and variable costs and making a profit. However, the situation may be somewhat different for educational organizations. Many of these organizations develop and disseminate their products under grants from agencies such as NIE. Consequently, some or all of the fixed costs associated with development and dissemination of these products do not represent "real" costs to the organization and it may not be necessary to price the product in a manner designed to recover these costs. In addition, some organizations which develop educational innovations are nonprofit organizations and thus are not concerned with profits when pricing their products. Therefore, organizations which develop educational innovations may vary in their procedure for pricing their innovation. Profit making organizations may set price to cover all fixed and variable costs and provide a certain level of profit. In contrast, nonprofit organizations may set price in a manner which simply covers all fixed and variable costs. The important thing for any organization to do when setting price is to determine what costs must be covered, what level of profit is desired, and how price will impact on demand (and thus influence costs and profits) and then establish a price consistent with these factors.

Pricing Strategies. In developing a pricing strategy for a new product, two strategies are available: skimming and penetration. A skimming pricing strategy entails initially pricing a new product at a relatively high level to take advantage of the fact that some buyers are willing to pay a higher price than others, and then over time reducing the price to attract additional customers. This strategy is most appropriate when:

(1) there are a significant number of people who are willing to pay the initially high price;

(2) there are barriers to competitive entry, such as patents (otherwise the high price would make competitive entry likely);

(3) there is a desire to recoup the investment made in the product quickly;

(4) price is used as an index of quality, and high quality is desirable.

An alternative to skimming pricing is a penetration pricing strategy. It entails setting the price of a new product at a relatively low level in order to capture a substantial proportion of the market quickly (i.e., penetrate the market). This strategy is best used when:

(1) purchasers are price sensitive;

(2) unit costs of production and distribution decline as output increases; and

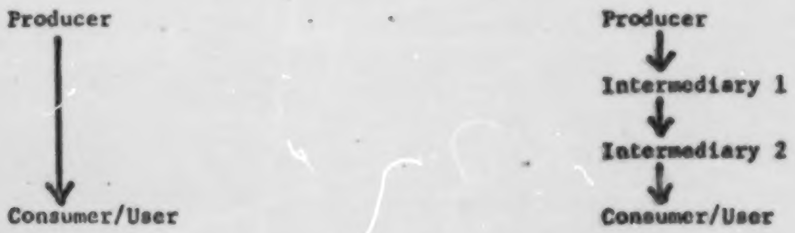
(3) a low price is likely to discourage actual or potential competition.

Although either a skimming or a penetration strategy could be employed by an organization introducing an educational innovation, a penetration strategy appears to be more consistent with the goal of rapid diffusion of educational innovations. Furthermore, since adopters of educational innovations are likely to be highly price sensitive in light of the fact many schools are experiencing severe budgetary problems, a penetration strategy is appropriate.

Sub-Task: Channels of Distribution

The Structure of a Distribution Channel. The distribution of product innovations entails the movement of innovations from the point where they are developed to the point(s) where they are adopted and implemented. Channels of distribution vary on two basic dimensions: the number of different intermediaries and the number of each type of intermediary. A channel of distribution may be direct or have no intermediaries, as shown in Exhibit 7, or may be indirect and have several intermediaries as shown in Exhibit 7.

Exhibit 7



a. Direct Channel

b. Indirect Channel

The decision regarding the number of different types of intermediaries and the number of each type of intermediary should be made after a careful consideration of the characteristics of the product, the market, and the producer. However, before turning to a discussion of these factors, the functions performed by the members of a channel of distribution require examination.

Functions Performed by Channel Members. Members of the channel of distribution must perform three basic types of functions: exchange, distribution, and facilitation. The exchange function involves the actual buying and selling of the product or innovation. In the direct channel depicted in Exhibit 7, the producer and consumer would perform the selling and buying functions, respectively. In more complex channels of distribution, several channel members may perform each of these roles.

The distribution function involves the actual transportation, and sometimes storage, of the product. Sometimes the producer may perform this function by sending the product to the consumer through the mail or some other mode of transportation, while in other instances either an intermediary or the consumer may perform this function.

Finally, there are a number of facilitative functions performed by channel members which expedite the exchange process. These include providing financing for purchases, informing potential consumers about the product, and assuming the risk associated with the introduction of a new product (e.g., R&D costs). Different members of the channel of distribution may perform each of these facilitative functions. An intermediary may provide financing for the purchase of expensive educational innovations. A producer may take charge of disseminating information about the product. And a facilitative agency such as NIE may assume much of the risk associated with a new product introduction by providing funding for the project.

These three basic functions are inviolate, though they may be performed by different channel members in different situations. The decisions regarding who shall perform these functions should be based on an assessment of who can perform them most efficiently. This, like other channel decisions, is a function of characteristics of the product, the market, and the producer.

The Impact of Characteristics of the Product on Channel Decisions. Four major characteristics of the product impact on channel decisions:

(1) knowledge required to sell the product,

(2) service requirements of the product,

(3) perishability of the product, and

(4) unit value of the product.

If substantial knowledge is required to communicate effectively about the product then a direct channel in which the producer performs the "selling" function is usually most appropriate. This is because the intermediaries available are unlikely to have or be motivated to acquire the knowledge necessary to do an effective job of disseminating the product. Similarly, the service required by the product also influences channel decisions. If the product requires servicing by technically trained personnel, intermediaries are typically not used because they are unlikely to be able to perform the service function effectively. Products which are highly perishable are also likely to be distributed through special intermediaries. Educational innovations may be perishable in the sense that their value is diminished if they are not distributed rapidly. Finally, the unit value of the product influences selection of a channel of distribution. If the unit value of a product is low, direct distribution may be impractical since it will probably increase the cost of the product substantially (direct distribution is typically more costly than going through intermediaries).

The Impact of Characteristics of the Market on Channel Decisions. Two characteristics of the market, the extent and concentration of demand, and consumers' buying patterns, influence the selection of a channel of distribution. If demand is extensive and concentrated in a particular area, a producer may find it worthwhile to use a direct channel of distribution and gain the benefits of having well-trained, specialized representatives. On the other hand, when demand is less extensive and geographically dispersed, intermediaries are likely to result in more efficient distribution. The buying patterns of the target must also be considered in making the channel decision. When purchases are small and frequent, indirect channels of distribution are typically used.

The Impact of Characteristics of the Producer on Channel Decisions. Finally, two attributes of the producer or developing organization affect channel decisions, (1) size and resources of the producer and (2) breadth of product line of the producer. If the producer is large and has substantial experience with the target market and the innovation, then direct distribution may be attractive. Thus, a large organization which specializes in educational products may find it worthwhile to maintain its own sales force. On the other hand, a small organization and/or one which has little expertise with educational products may wish to use an indirect channel. Similarly, if an organization has a broad product line across which the costs of direct distribution can be spread, it may be more practical to maintain a direct channel of distribution than if it produces relatively few products.

Managing the Channel of Distribution. A channel of distribution is a loose coalition of organizations that through cooperation seek to move goods to ultimate users. While these organizations share the common goal of moving goods to users, they also have separate goals which may work against achievement of the common goal. Specifically, while organizations concerned with the diffusion of educational innovations, such as laboratories (e.g., Far West), REA's, and SEA's, may share the common goal of moving educational innovations to users, they also may have conflicting goals. In fact, these organizations may be competing for funds, power, and prestige in the education arena. How, then, can these organizations be motivated to cooperate to insure the efficient movement of educational innovations to the ultimate user?

Several strategies may be employed to increase the efficiency of the channel of distribution. First, it may be appropriate to identify a "channel captain" of an organization which will be the driving force behind the channel of distribution. In an education setting NIE might play the role of the channel captain. It is important that the channel captain's primary objective be the efficient movement of goods to the user. The channel captain may then attempt to structure the channel of distribution and the rewards in the channel of distribution so that other channel members focus on this common objective, rather than their own organizational objectives.

To facilitate cooperation in the channel of distribution, the channel captain may attempt to implement specific policies designed to reduce or resolve differences between channel members. For example, an exchange of persons strategy might be instituted. Under such a strategy, senior personnel from one organization in the channel spend time working in an organization at another level in the channel. Thus, an administrator from an REA might spend six months working in a laboratory such as Far West, and vice-versa. This would enable the channel members to better appreciate each other's problems and goals and thereby would reduce conflict to a more functional level. Another strategy which might be employed is establishment of a mediation procedure to resolve differences which do arise between channel members. Mediation helps resolve conflict since channel members make concessions to a mediator rather than to each other.

Finally, effective management of the channel of distribution requires that the channel captain institute feedback procedures in the channel. Consumer needs are constantly changing and channel members, particularly those who are in direct contact with the consumer, should be trained to monitor and feedback information about such changes. The channel captain may regularly survey members of the channel to facilitate such feedback.

Sub-Task: Promotion

Promotion activities are generally formulated once product, price, and distribution strategies have been established. The major function of promotion is to provide potential users of educational products with the information needed to make informed choices. Three vehicles are available to perform this function: advertising, personal selling, and publicity. Advertising is any paid form of non-personal communication disseminated by an identified sponsor. In the educational context, advertising involves the use of trade journals and direct mailings. Personal selling entails contacting parties to the adoption and implementation process directly and informing them about the product's attributes. Verbal presentations as well as actual product demonstrations may be used for this purpose. Publicity is a non-paid for form of promotion which is disseminated by various media because it is newsworthy and interesting to the media's audiences.

A critical task in developing a promotional strategy involves coordinating advertising, personal selling, and publicity. To this end, it is useful to develop promotional objectives before making decisions pertaining to how promotional tasks will be achieved. Indeed, the statement of a precise set of promotional objectives is pivotal to developing effective promotional approaches; it guides the selection of promotional vehicles, the communication content, and the indices for measuring advertising effectiveness.

Statement of Objectives. A first step in developing promotion is to articulate a precise set of objectives. Promotional objectives typically consist of four components.

1. Market Target. The various publics and their relative importance must be specified. We have discussed how this task may be performed when we examined segmentation strategies.

2. Communication Task. Under this heading, a statement of the product attributes you wish to convey to each target is specified. Identification of this aspect of the promotional objective emerges from the needs assessment discussed earlier.

3. Desired Change. What effect or result is desired in response to the promotional activity should be stated. The desired change may be stated in terms of communication indices, such as awareness of the product, attitude toward the product, and intention to adopt it, or in terms of actual adoption and implementation.

The selection of the appropriate change index depends on two factors. One is the product's stage in its life cycle. More specifically, when the product is initially disseminated focus may center on achieving product awareness and a favorable disposition toward the product. In later stages of the product's life cycle, the rate of adoption is likely to be the main criterion in developing the desired change objective.

The other factor to consider in establishing the desired change objective is the promotional vehicle used. For most educational products, the role of advertising (whether it entails placing space in trade journals or direct mailings) and publicity is to make people aware of the product and provide information which enables a judgment of its appropriateness for them. In contrast, personal selling is usually intended to stimulate trial.

It should be noted that none of the promotional vehicles are conceived as being sufficient to induce adoption. Indeed, this is the task of the product. Rather, promotion is seen as stimulus which facilitates the adoption and implementation of those products which match educators' needs. By the same token, promotion may serve to speed the demise of unneeded products.

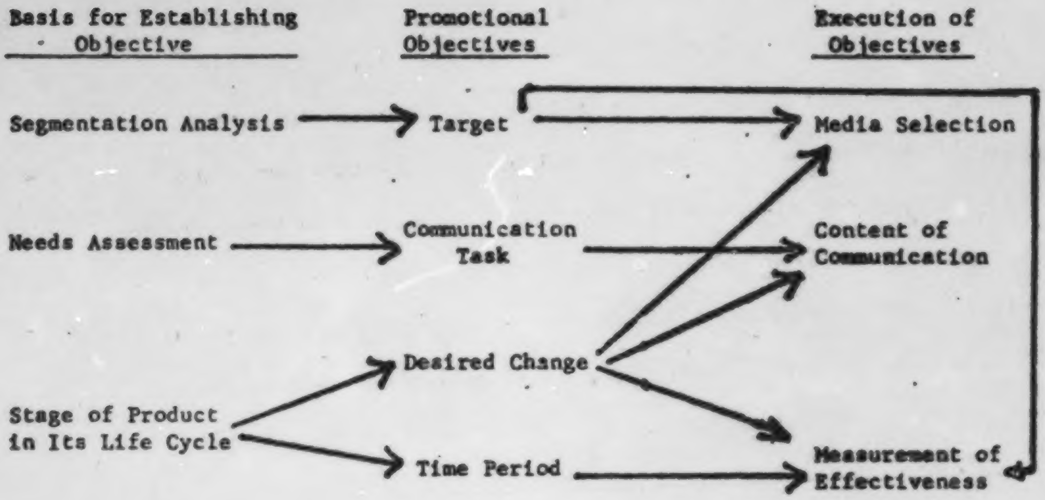
4. Time Period. The final component of a comprehensive promotional objective is a statement of the planning horizon. By specifying the length of time it will take to achieve the desired change among the various targets, the educational planner indicates when the promotional program should be evaluated. Although the time periods for promotional activities are frequently reviewed on an annual basis, such an arbitrary planning horizon is not always appropriate.

To this point, we have focused on the components of objectives and the information that constitutes the basis for establishing promotional objectives. This discussion is summarized in the first two columns in Exhibit 8. As we noted earlier, a statement of objectives is pivotal in developing promotional strategies. In effect, it entails coordinating knowledge of the market and product and using this information to establish a precise set of goals. In turn, objectives are the foundation on which executions of promotional activities are developed.

Media Selection. Consider the media selection decision first. As Exhibit 3 shows, one important input to the media selection decision is the desired change. If the desired change is in awareness of the product or a favorable disposition toward the product, then this suggests two promotional instruments: advertising and publicity. The advertising options typically most useful in disseminating educational products are educational journals and direct mail. Publicity is often an effective device, since unlike advertising it is presented by a source who stands little to gain by the presentation of information. Although publicity in newspapers, magazines, and professional journals[4] requires no expenditure for the space, it does require

Exhibit 8

Promotional Objectives: Their Antecedents and Their Execution


Basis for Establishing Objective
Promotional Objectives
Execution of Objectives
Segmentation Analysis
Target
Media Selection
Needs Assessment
Communication Task
Content of Communication
Desired Change
Stage of Product in Its Life Cycle
Time Period
Measurement of Effectiveness

active solicitation of the various media by the educational marketer. It is necessary to demonstrate to the media why a feature on an educational product will be of interest to their readers.

In situations where focus centers on achieving intention to implement and actual trial of the educational product, personal selling is the most appropriate promotional vehicle. This may entail having salespeople explain the use of the product as well as having demonstration sites to permit product trial. The latter vehicle is particuarly important when adoption and implementation involve a large financial expenditure in personnel and/or equipment. As noted earlier, permitting trial with limited commitment enables those responsible for adopting and implementing a product to convince themselves of its utility.

By specifying the change desired, decisions can be made regarding the resources to be allocated to professional journals, direct mail publicity, personal selling, and demonstration sites. It does not, however, permit a precise determination of the vehicles to be used. For example, given an objective of creating awareness, it might be decided to spend one-third of the marketing budget against advertising. The question is: should this be achieved by using journal advertising, direct mail, or both? And, if journals are appropriate, which journals should be selected?

To address these issues requires a consideration of the target objective. If the target is comprised of a large number of people who are similar in some respect (e.g., teachers), then it is often most efficient (in terms of cost per reaching each person) to use journals. On the other hand, if the target group is limited in size and heterogeneous in nature, then direct mail is likely to be the most efficient means of disseminating information. It permits tailoring of the appeal to the specific target with a minimum of wasted media coverage of those unlikely to influence the buying decision. A knowledge of the target is also useful in choosing between different advertising vehicles. If, for example, superintendents are to be reached, then those journals that have a disproportionately high superintendent readership per dollar spent in advertising would be selected. In essence, the attempt is to match the target to be reached with those vehicles which attract high target readership.

Communication Content. The selection of the appropriate communication content is based most directly on the communication task. In turn the communication task is determined by a knowledge of what consumers want, what product features you can deliver, and what alternatives are currently available.

A second factor that contributes to the communication content decision is the change desired. When an educational product is launched, the initial objective is to achieve awareness. In this situation, it is appropriate to provide limited information about all major product attributes.

An important aspect of the communication content decision is to insure coordination in various media. This is not to say that the same information should necessarily be communicated in advertising, direct mailings, and personal selling. In fact, as we noted earlier, these media for information dissemination may be suitable for presenting different types of information. Rather, an attempt should be made to insure that the different media are used in complementary ways - advertising to make people aware and favorably disposed, and personal selling to convert favorable disposition into trial.

Measuring Promotional Effectiveness. This task should be performed on a continuing basis starting before a product is launched. Pretesting promotions involves a rather minor expenditure before a heavy investment is made in product dissemination. Pretest may entail insuring that the attributes discussed in promotional materials are important to information recipients, that the information conveyed is understood, and that it motivates interest.

The monitoring activity should continue after the product is launched. This involves tracking demand for the product over time. Of equal concern is the generation of data which provide insights as to the reasons for the level of demand observed. Specifically, surveys of people's product awareness, disposition toward the product, intention to try it, should be conducted and the rate of inquiries generated by various promotional devices should be measured. These data not only indicate why a product has generated a certain level of demand, they provide a starting point for developing strategies to rectify that facilitate product dissemination. For example, if awareness is poor this may suggest the need for adjustments in media used and/or the need to increase sales calls and advertising exposures. In contrast, if awareness is substantial, but people are not favorably disposed to the product, then the attributes stressed in the communications are likely to require adjustment. These and other implications derived from measuring advertising effectiveness are illustrated in Exhibit 9.

Although we have focused on measuring the effectiveness of promotional strategies, this analysis may be extended to monitor the impact of product, channel, and price strategies as well. For example, high product awareness and trial but an unfavorable attitude toward the product and little adoption suggest that product modifications may be necessary, whereas high awareness awareness, preference, and trial but little adoption suggest distribution inadequacies.

Orchestrating Marketing Tasks

To this point, we have examined each marketing task separately. Effective marketing strategy requires a coordination of product, price, channel and promotion strategies. Orchestration of these marketing mix elements and the dollar allocation to each is dependent on consumers' response to various products in the educational marketer's portfolio. We shall identify several of the most common situations facing the marketing decision maker, and suggest the appropriate strategic response for each situation.

Product Introduction Phase. In the early stages of product dissemination, investment spending is typically required against all marketing tasks. In relation to the revenue generated from product dissemination, the expenditures incurred in the product introduction phase are high. Indeed, financial losses are often incurred in this phase. Expenditures required to identify the market, to engage in product development work, to promote an educational product and to distribute the product are considerable, while demand for the product is low.

Growth Phase. If market analysis has been accurate, the investment expenditure during product introduction results in a rapid acceleration in product demand. To enhance this demand during the growth phase, investment spending is typical. However, the investment spending undertaken in growth differs from that employed during introduction. Whereas introductory investment expenditures are heavily allocated against market analysis product development, distribution and promotion, investment spending during the growth phase are often more heavily allocated against price and distribution. Furthermore, the rapid increase in demand, characteristic of the growth phase, results in a positive return on the marketing investment.

Maturity Phase. Once demand for a product has stabilized, in the maturity phase, several strategies are available to the educational marketer. One entails maintenance spending. Using this approach, enough funds are allocated to the marketing effort to sustain product demand at its present level. Alternatively, a harvest strategy may be employed. This entails reducing the marketing expenditure for a product in order to increase the cash flow. Use of a harvest strategy is predicated on the assumption that the decline in demand resulting from a reduction in the marketing budget will be more than offset by the budget savings. The increase in cash flow which results can then be invested in new product opportunities. A harvesting strategy is particularly appropriate when the educational product producer has a substantial number of loyal repeat purchasers. In this situation, the reduction in marketing effort is unlikely to result in a comparable decline in patronage.

In the maturity phase of educational products, it may be useful to focus on those institutions that have limited financial capability for new product acquisition. In marketing to this target, the price of the product may be lowered to attract this segment. Alternatively, product improvements may be instituted and price maintained if more financially-able targets are being considered.

Decline Phase. In the decline stage, when demand for a product is declining, the educational marketer should consider an abandonment strategy. This entails withdrawing marketing support from a product; advertising is withdrawn and price may be increased. Abandonment is appropriate when it is anticipated that the dollar allocation toward marketing activities will be greater than the revenue generated from product sales. If the product demand continues to decline when marketing support is retracted, it should become a candidate for dropping.

III. MATRIX ORGANIZATION AND THE R&D PROCESS

So far the marketing organization has been described in terms of its constituent task flow processes. The major feature of the marketing design is the

Exhibit 9

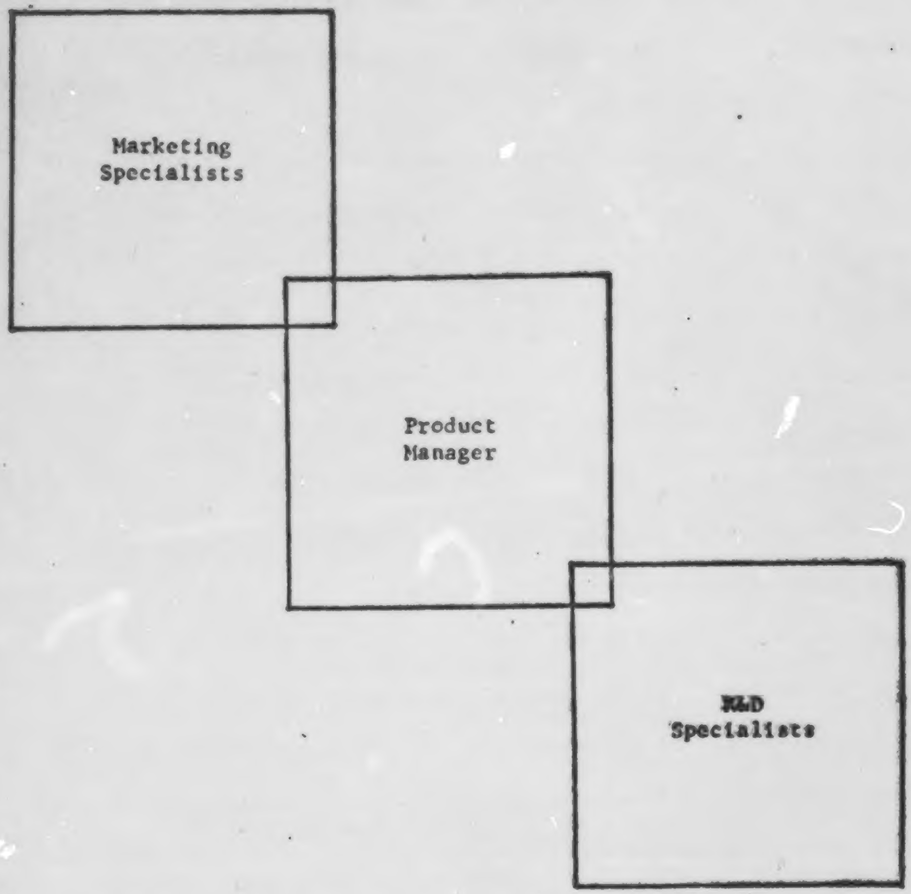
Measure of Advertising Effectiveness	Performance			
	Case 1	Case 2	Case 3	Case 4
Product Awareness	−	+	+	+
Disposition toward Product among Those	+	−	−	+
Trial	+	−	+	+
Adoption	+	−	−	−
Strategy Suggested				
Media Require Changing	✓			
More Exposure/Sales Calls	✓			
Change Communication Content		✓		
Modify Product			✓	
Change Distribution Channels				✓
Alter Price			✓	

way in which the R&D process is embedded in the organization to make it maximally responsive to the user. This embedded structure takes two forms. First, the R&D process is placed between the market analysis process and the strategic marketing process. Products do not originate with the R&D process so much as pass through it. Second, the R&D process is further embedded within the strategic marketing process itself. It becomes a part of the new product development task in order to ensure feedback from the target segment.

For a complete description of a marketing design, however, it is also necessary to consider the relationship of personnel to these processes. After a history of considerable experimentation in the private sector, it is now widely accepted that the best form of personnel structure for the marketing approach is the matrix organization. In its most general form the matrix organization represents a trade off between centralized (tall) and decentralized (flat) organizations. In the matrix organization, project coordinators function like the heads of decentralized departments. They attempt to make sure that all decisions take account of the particular requirements of their project. But they also draw upon the centralized resources of a group of experts in making their decisions.

Exhibit 10 displays a matrix organizational structure which is very common in marketing. This structure is generally termed a "product manager" organization. While ultimate responsibility rests with a marketing executive, the day to day responsibility for products is decentralized to individual managers. If there are a large number of products, not only is there a manager for each one, but related groups of products have managers, and there may be an overall divisional product manager as well. In contrast to this decentralization, there also exists a group of experts centralized at the division level to perform key tasks. Usually these tasks are those relating

Exhibit 10


Marketing Specialists
Product Manager
R&D Specialists

Embedding the R&D Process through Matrix Organization to marketing research, promotion, and distribution. The product manager has responsibility for the remaining tasks and, more importantly, for integrating the work of the centralized specialists to ensure the best product possible.

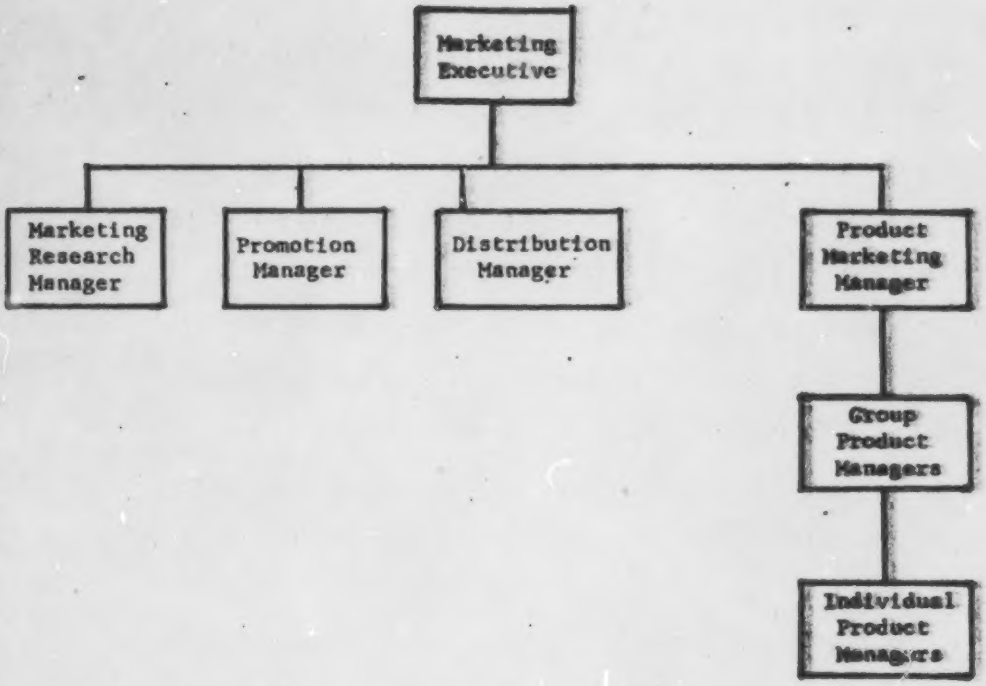
It would be expected that a marketing approach to educational products would make use of such product manager design. But the most important implication of the matrix structure is for connecting the R&D process to the marketing processes in which it is embedded. The product manager is the natural vehicle for ensuring that marketing tasks do flow into the R&D process as prescribed. To do this the product manager must use not only marketing personnel as centralized specialists but R&D personnel as well. As portrayed in Exhibit 11 the product manager overlaps with both marketing specialists and R&D specialists. His role is to form a link through which the marketing tasks we have described can be related to R&D activities.

The marketing design proposed here would employ product managers as the linking pins with which to embed the R&D process in the organization.

Resources, Not Boundaries

The proposed marketing design has purposely been left ambiguous in one important respect. The design could apply to a specific organization, such as an existing Regional Laboratory, or it could apply to the entire system of R&D activities, or to some portion thereof. Consideration of these possibilities is beyond the scope of this paper. It should be pointed out, however, that the general design proposed is in principle neutral to organizational boundaries. The design has been presented in terms of tasks and personnel relations. These may be placed within specific organizational boundaries in a wide variety of ways. But the overall design principles are not altered by these boundaries. It does not matter whether the market analysis process and the marketing research specialists associated with it

Exhibit 11


Marketing Executive
Marketing Research Manager
Promotion Manager
Distribution Manager
Product Marketing Manager
Group Product Managers
Individual Product Managers

A Product Manager Organizational Structure are housed institutionally together with the R&D process. This is not to say that problems may not be encountered with institutional separation, as with, for example, the authority of the product manager. It is just that the general marketing design still applies.

More relevant than the question of organizational boundaries is that of resource allocation. It should be clear that implementation of the marketing design proposed here would require a massive restructuring of the resources available for educational products. Funds would have to be shifted away from R&D per se into the marketing tasks. It is this reallocation of resources rather than the problem of organizational boundaries that would prove most difficult in implementing the marketing approach.

SUMMARY

In this paper, we have outlined a marketing approach to the development and dissemination of educational products. The implementation of a marketing approach entails focusing on the needs of potential product users as a basis for product development and dissemination. Thus, the marketing approach is user-driven. On the basis of research pertaining to user behavior, homogeneous markets can be identified, and product, price, channel and promotional strategies can be developed to satisfy educators' needs. In order to implement the marketing approach successfully, a matrix organization is suggested. This organizational design ensures coordination between the R&D process and the marketing process in which it is embedded.

CHAPTER SEVEN

THE BALANCED PRODUCER-CLIENT LINKAGE EXCHANGE: THE R&D EXCHANGE AS SEEN FROM MODELS OF KNOWLEDGE PRODUCTION AND UTILIZATION

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INTRODUCTION

The central theme of this paper is balance. Based both on a review of what models of knowledge production and utilization (KPU) have to tell us, and on what operational elements we see within the R&D Exchange's initial design, we will argue that maximum impact and utility of the RDx effort can be achieved only if there is a balance between the needs and interests of potential clients on one hand, and the services provided by RDx on the other. Balance also means the sharing of power, inputs to the effort (informational and procedural), and responsibility for outcomes.

It is hard to disagree with so basic a statement of the issue, yet we will see below that there are some important areas in which the RDx design is already out of balance. This has happened chiefly because the effort was designed more by information providers than by potential clients, and because the conceptual approaches of the designers of any KPU effort are important forces in shaping what the effort will become.

We will approach the issue of balance in two ways: first, we will discuss the conceptual approaches to KPU, concentrating on the assumptions behind them. An expanded "linkage" model will be used to synthesize earlier "polar" approaches, and to explore forces which underlie or predict linkage. Second, we will analyze RDx using the concepts and criteria elaborated, to arrive at a series of problems and recommendations.

CONCEPTUAL APPROACHES

How an individual views the KPU process usually depends on where that individual is in the process. Knowledge producers, linkers, and potential or actual clients tend to see it in different ways, emphasizing parts of the process or using different analytical bases resulting from their different backgrounds, positions, and most of all, needs and interests. When a field attempts to build a large and carefully-planned KPU effort, there is always the danger that the effort will take on the character of the conceptual approach of its designers; *and* it is almost always the case that *KPU efforts are seen as needed and are designed by information producers or intermediaries*. The reasons are simply that producers and intermediaries are *rewarded* based on the extent to which their products are disseminated, recognized, and (increasingly in recent years) put to use. One must always ask *whose* conceptual approaches are represented in the design of a KPU effort, and what *assumptions* these approaches contain. The aim should be to design a KPU effort from a conceptual approach which is *shared* by both the producer and potential user, but this is difficult in large-scale efforts where producers, intermediaries, and clients are separated by great distances of space and time. Most particularly, it is difficult to achieve a shared approach where there is no direct interaction *from the very beginning* among these three groups.

Input from the potential client is often lacking because: (1) clients' concerns are most often with their own products and outputs, not with potential inputs (particularly if these inputs are abstract or need localizing); (2) clients are usually scattered around the map, unoganized, and are so large a group that even could they be brought into helping with the design, they would either overwhelm the process or be so diverse that they could not come to a consensus among themselves. Hence, we have seen the rise of "need-sensing" methods and efforts, whose goal is to survey the problems, needs and capabilities of potential clients. These approaches usually contain two flaws, however: (1) they rarely survey the basic conceptual approaches clients hold about the KPU problem; and (2) they almost always begin with needs for information and not broader needs (and only by a comparison with informational vs. other needs can we determine the perceived importance of information, or of that subset based on R&D on which most KPU efforts are based).

As we will see later when we take a detailed look at the RDx design, the designers are not clients, nor are many clients represented directly in the process. Further, the effort, by its very name and in the emphasis it puts on input and service functions, is geared primarily to the R&D subset of information, and certainly to information as contrasted to other possible kinds of "solutions."

The "Polar" Conceptual Approaches: "R,D&D" vs. "Problem-Solver"

Most KPU efforts attempt to balance two different views of the KPU process: that of the producer and that of the potential client. As Havelock (1969) categorized them, these will be called the "Research, Development, and Diffusion" (R,D&D) and "Problem-Solver" approaches, respectively. The first is concerned primarily (though not exclusively) with developing uses for knowledge coming from the R&D process. The second is concerned primarily with getting help for practitioners in solving real problems (note that we do not say "users," since this term is an already biased view of the role of this group).

The R,D&D approach concentrates on describing the successive stages of activity involved in the basically "linear" (though often recycling) process through which knowledge derived from research is taken through developmental testing and into marketing or diffusion activities designed to "sell" or achieve uses for that knowledge. The approach assumes that the process is and should be staged, rational and logical, and that the users of outputs are themselves "rational-logical." A key assumption here is that, however the ultimate product is derived (either flowing) directly from research discovery or as the result of applied research based on need statements), empirical operations and research expertise are required to come up with a product. The concentration is often on planned, large-scale efforts, and on "top-down" direction and flow of products and influence. This is a centralized notion of control amenable to program developers. For our purposes, however, the most fundamental assumption of the R,D&D approach which we question seriously in relation to RDx is that it is possible to design a truly effective effort through systematic arrangement of organizational-level components, without the direct participation of the potential client in each step.

On the opposite pole is the "Problem-Solver" approach, which begins with a felt need in some practioner (non-researcher) group, or with the derivation of needs as the result of some intervention or change-agent activity. The focus is on finding the best solution to the need, regardless of its source or form. The process through which the client group is taken is as important as the substance of the particular solution, because of the problem-solving process learning assumed to take place.

One way to contrast these two approaches is to consider what is "fixed" and what is "free to vary" in each. In the R,D&D approach, empirical knowledge is the given or fixed component, and potential applications are more or less open. In the Problem-Solver approach the need is fixed, and the potential solutions are open. The crucial issue is the relevance of

R&D for client needs -- KPU efforts often assume too uncritically that information is the best solution, while clients most often view information as having less immediate benefit or payoff than other kinds of solutions (e.g., manpower, funds, support, legislation, innovative practices, etc.).

Ultimately, neither of these approaches is a complete model of the KPU process. The R,D&D approach stresses the "KP" at the expense of what we know from organizational change and development regarding the "U" or utilization process; the Problem-Solver approach looks for solutions without too much regard for developing capacities outside of the practitioner organization which can help that or other organizations in the future.

Linkage: A Synthesis

The concept of "linkage" deals with relationships between a resource person or group and a practitioner or practice organization which continuously facilitates and promotes mutual information exchange and helping activities with respect to significant practice needs. Each underlined term is important. "Continuously" highlights the need for more than one-shot or fleeting phenomena; "mutual" stresses the dialog component and opportunity for impacts on both producers and clients, plus the notion of openness and active relationships; "helping" involves a commitment and involvement, and the notion of evaluation of activities to see if they really do help; "needs" stresses again that the focus of the linkage is on the resolution of needs (not on the delivery of some product).

Linkages may take on the character of ideals the KPU effort would like to achieve. To facilitate linkages we need to know more than what they are -- we need a sense of what predicts or leads to their establishment. The model we have developed organizes predictor forces by levels:

Societal: direct effects of laws, supports, social climate and the evolution of social issues, economic pressures, etc.

Organizational: leadership, goal definition and decision-making processes, skills, capacities, participation, reward systems.

Individual: attitudes about change, risk, etc., training, skills, knowledge, role clarity, and power.

Procedural: fit between situation and linkage media, redundancy, capacity, and fidelity of channels.

Content: communicability of the messages (both needs and solutions), innovation-organization fit for clients; the fit of needs with R&D and service program plans and capacities for solution providers.

We need to do more than the current trend in KPU theory of listing predictor factors, however. These forces act in one of four ways: (1) affecting both linkage partners equally; (2) affecting either or both linkage partners, but separately; (3) affecting both through their similarity on the factor; and (4) affecting both through their compatibility on one or a set of factors. (A more detailed treatment and statistical model are given in an appendix to our complete paper.)

In summary, KPU approaches must be evaluated regarding their assumptions, and must be related to RDx to determine: (1) the kinds of approaches used in the planning of RDx, (2) the suitability of a particular approach to the effort, and (3) suggestions regarding directions RDx might want to explore coming from these approaches, particularly from the syntheses suggested by more recent writings on KPU models.

LOOKING AT RDx FROM THE KPU MODELS

In our complete paper we describe RDx through use of eight "operational modes" (Havelock, 1974; Havelock and Lingwood, 1973). These modes are more concrete elaborations of the perspectives represented in the R,D&D,

Problem-Solver, and Linkage approaches. Below we provide a brief description of each mode, where RDx is in relation to that mode (as taken from our knowledge of RDx and from the draft RDx solicitation; NIE, 1977), and our reaction based on knowledge of both KPU theory and RDx planning. The modes are presented in a sequences based on increasing levels of client involvement or "client-orientation."

"Natural-Network Nurture"

Elements: KPU functions are added to information flows taking place in existing networks: professional interest groups, "invisible colleges," etc. Special KPU activities are funded in this context.

RDx Plans: "The R&D Exchange will concentrate on strengthening these channels and making sure that high-quality R&D outcomes and exemplary practices are available."

Predictive Factors: There are likely to be several different and poorly interconnected networks (e.g., among producers and among practitioners). Group-centered factors, rewards, skills, and values limit interconnections.

Comment: This mode is subject to what is available in terms of existing networks, and these tend to be stratified into practitioner and R&D networks with little linkage between the two. This is a very "laissez faire" approach to KPU. It is important to identify practitioner and R&D informal networks, since these are powerful shapers of consensus, and are information sources highly trusted by their members. However, major KPU goals are not likely to be achieved only by making inputs into these networks. If they are seen as powerful linkage forces, we must ask why they have not already done the job? It is important, however, to strengthen practitioner networks, and state-to-state information and resource exchanges are helpful here. This can help re-balance power in RDx, giving a centralized and coordinated voice for practitioners to back up feedforward (need) information.

"Continuous Flow Dissemination"

Elements: This is a partial mode covering dissemination of printed materials of two types: popularized serial publications which bridge between R&D journals and non-researcher audiences, and selective dissemination of information, in which printed materials are matched to reader interest and need profiles.

RDx Plans: Operations Support will be involved in publicity, and special publications and newsletters are planned and may be targetted based on user needs and interests.

Predictive Factors: Given the low chance for reciprocity in this mode, factors affecting producers are not likely to be changed by these activities, and thus, the knowledge base is not likely to be altered much over time. This is, then, not truly a linkage.

Comment: RDx is not oriented to mass audiences, and so this mode is best used for general awareness, publicity, and to cast a weak but broad net which may catch a few new people. RDx does have a role to play in serving as a broker for practitioners, screening and recommending the best of the many popularized and SDI publications available.

"R&D Product Dissemination Service"

Elements: Here R&D products are screened for quality by a central group, transformed, and disseminated (also with demonstrations and consulting help on adaptation and utilization). The focus is on planned dissemination and utilization efforts to sell R&D products; and this depends on the availability of usable R&D. Limited need-"re-sensing" is done, to insure that needs still equal those which supposedly drove the creation of the R&D base initially.

RDx Plans: Several RDx activities fit in this mode. Operations Support will screen R&D for quality; R&D Interpretations will analyze available products and transform them, especially in high priority areas. Exchanges and contractors will assist linkers in disseminating products. Identification of information resources, the regional R&D resource exchanges, adaptation and distribution of materials, etc. all fit in here.

Predictive Factors: The most crucial factors here affect the need-sensing component, since RDx has been well designed on the solution-delivery side. Organizational capacities to deal with competing need statements will be important (e.g., normative needs determined by surveys, individualistic ones coming from the Exchanges). At the procedural level, the need-sensing paths in RDx are long and indirect.

Comment: The key to success in this mode is the combination of R&D product screening for quality given the context of current needs of clients or targets. R&D Interpretations will do no direct need-sensing, and may be somewhat isolated from the needs and uses of the ultimate consumer of its products. Thus, the Exchanges and Operations Support will have to be active need processors, and this may be submerged in the press of other activities and priorities. The primary linker clients may limit the ability of RDx to determine the needs of the ultimate clients, educational practitioners. Multiple need-sensing paths are needed, just as multiple delivery paths are required to build in redundancy and error-checking.

"Instant Response R&D Retrieval Service"

Elements: User information needs are channeled through a "hotline service" to information and human resource data banks; output is tailored somewhat to meet the user's situation and needs, and is returned to the requestor by mail or telephone. Answers to questions asked frequently may be pre-packeged. Complicated or unusual requests need separate processing and additional clarification of the user's needs. This approach depends on having an up to date and useful bank of R&D information, and adequate human resource banks.

RDx Plans: RDx does not wish to duplicate ERIC operations, which are similar to this mode, but will provide assistance for clients in training and access to systems. The Regional Exchanges will do some of this, but in a more informal manner through the small regional R&D resource centers they create. Many Labs already have data based search capabilities.

Predictive Factors: This mode depends on the skill and knowledge of the initial point of contact, the "hotline" operator. Operators must have good need-sensing and probing skills, knowledge of the human and R&D resource bases, etc. Capacities of human resources are also important predictors; it is easy to over-work those persons who have given good service in the past.

Comment: This mode is a compromise of the notion of true client-orientation, since the range of possible help is fixed to what now exists in information or resource banks, and the client has no real ability to influence the contents of either. This approach works where the scale can be kept small and on a person-to-person basis, or where R&D has useful answers to give. In the RDx case, scale can be controlled by doing this at the regional level, but educational R&D and human resource banks will often fail to produce definitive answers. In these instances the service must be able to drop R&D information as its base and to switch to providing skills which may be applied directly in helping solve clients' problems.

"Rapid-Response R&D Report Service"

Elements: This is similar to the mode above, but with much more depth and composition of responses. State-of-the-art reports are tailored for each client by "writer-experts." This level of detail must be reserved for important issues which do not demand immediate responses in crisis situations, because of the costs and time required to respond. This mode works best in instances in which the clients have the power to demand custom services, as in the case of the Congressional Research Service.

RDx Plans: High priority areas will be given this kind of attention on the review side, and (hopefully) almost as much on the tailoring side, by R&D Interpretations.

Predictive Factors: Client power is the key issue here. In the RDx case practitioner clients do not have this level of power, and even linker clients may not, since neither group mandates the RDx effort itself. Policy-maker clients may be served in this mode by RDx, however. If RDx tries to serve both policy and practice it may encounter capacity and role-conflict problems.

Comment: This mode provides the most thoughtful and client-tailored coverage of the R&D base, but it is an expensive process. The size of the potential audience makes it hard to provide this level of service. It is almost impossible to break the cost-helpfulness equation which is at the root of many KPU problems and efforts. There is also an issue of how priority areas will be defined to require this in-depth coverage. What is needed is a process which will give clients the feeling that they have participated in defining, and hence have greater probabilities of using, these priority analyses. Again, there is little in this mode which will allow for impact on the educational R&D data base itself. This mode may be seen as a linkage between the writers and the client, but not between clients and the original R&D or solution-providing community. Thus, special attention should be given in RDx to linking unmet needs and recommendations which come out of work in the priority areas back to the educational policy, program, and R&D-funding communities.

"Coordinated Mission-Oriented R&D Programs"

Elements: In this mode the focus is on large-scale highly-visible R&D projects geared to affecting policy, rather than toward dissemination to practitioners. Management and monitoring are done at high policy levels. Change results through administrative and legal enactment and/or enforcement. Great attention is given to quality and relevance of the R&D product since the stakes are usually high. Need sensing is assumed to have been done at the societal or political levels.

RDx Plans: "Not within the purvue of the R&D Exchange." However, feedforward activities are designed to link with broad need-sensing, and the Regional Exchanges will collect, and contractors will process and report, needs data to R&D policy-makers.

Predictive Factors: RDx's role in passing needs along to other programs operating in this mode is important here, even if RDx does not want to undertake this work itself. Here RDx will enter an arena populated by powerful existing groups with vested interests in the shape of large-scale projects (e.g., funders, researchers, other NIE programs such as plans for a need-sensing network, etc.). RDx will thus need a well thought out and demonstrably accurate need-sensing capacity, and the top-level capacity to make linkages with policy-makers.

Comment: We agree that RDx should not attempt to operate in this mode or become active in sweeping "social problem oriented" R&D.

Yet, in serving as a need-senser, there is no clear path or planned linkage with those who do operate in this mode.

"User-Centered R&D"

Elements: One style in this mode is "ad-hoc user research services," in which clients sponsor R&D to meet their own needs. Marketing and organizational research are examples of this. A second style, "user collaborative R&D," brings clients in as full partners in the research process. Action-research fits this second style, with clients active through all stages of the R&D.

RDx Plans: "Ac hoc R&D in response to particular practitioner's requests cannot be part of the R&D Exchange." At the regional level the Exchanges may serve as linkers between clients wishing to enter this mode and resources who might help them.

Predictive Factors: Reward systems of helpers or action-researchers are crucial in this mode (see Lingwood and Morris, 1976). An interdisciplinary orientation, openness and personal linkage skills are required of R&D personnel who attempt to work in this mode.

Comment: Even if RDx does not work in this mode, its broker role will be important. RDx might become involved in disseminating the results of such work, or with demonstration programs. Careful selection of demonstration sites will be needed, as will close RDx links to R&D funders, to insure that researchers know they can use sites linked to RDx in their action-research.

"Knowledge-Based Problem-Solving Consultation Service"

Elements: Here clients' needs control interaction with an outside consultant, and there is no "unsolicited" communication. R&D information is only one of many resources to the consultant, and the most fitting resource will be used, depending on the client's needs. The consultant also helps with the problem-solving process the client uses.

RDx Plans: Regional Exchanges will perform a few of these functions, with support from national contractors. The extent of involvement will not be great, however.

Predictive Factors: Consultants must have a wide range of skills and good linkages to knowledge and other resources in this mode. The resource system must be able to support the effort even if its most favored type of solution (e.g., that based on R&D) is not used. Regional Exchanges will require high levels of skill and capacity in operating in this mode. Also, the Exchanges may have to contend with need filtering or gatekeeping which may occur at the "linker client" level, i.e., between the Exchanges and practitioners' real needs.

Comment: While RDx will provide for identification of outside resources and experts who can work in this mode with clients, and may become involved here to a limited extent in such activities through tasks the Regional exchanges undertake, the effort is still based firmly in educational R&D, and this may limit the capacity of RDx to work in, or even foster this mode. It will also be difficult to maintain the R&D emphasis and acquire process and helping skills at the same time, particularly at the busy Regional Exchange level. Skill and problem-solving process training are optional services of the Exchanges, and we wonder how much of this will take place given the other demands on the Exchanges: there is a tendency to overload the "front line" in KPU efforts. Finally, this mode is more difficult to evaluate and monitor than are those modes which disseminate R&D information.

These operational modes may be seen as a developmental sequence, in the order we have presented them here, in many instances. KPU efforts tend to become more open to client inputs as early attempts (usually based on the existing R&D base) fail to meet needs. Even in education, the push for need-sensing grew more than a decade after the establishment of major dissemination activities such as ERIC. The simple sequencing of these modes masks the fact that fewer client organizations are involved in the most client-centered modes. Many client organizations drop out somewhere around the middle, particularly if they are not innovative enough, or lack imaginative leadership, in relation to the issue of change as a whole. Thus, from the producer's side, watching client groups fall away as efforts move down the sequence, this ordering is probably not developmental. From the perspective of the client group which can stay with the sequence as it comes more under its control, however, there probably is a developmental process here -- first becoming open to inputs from outside in the form of R&D information, next in seeing the gaps in the R&D base, and finally bringing empirical approaches to change inside the organization for greater control and wider scope of the effort.

A SUMMARY OF RDx LINKAGE ACTIVITIES

When we look at all of the activities through which RDx will make contact with practitioners and linkers, and compare these with the mechanisms through which these groups can influence RDx and the R&D community, we see clearly that RDx is more of a delivery system than a complete linkage effort. There are multiple delivery paths, but very low redundancy in, and certainly much less exposition given to, the need-processing component.

Further, most of the ties to linker and practitioner clients occur through the Regional Exchanges. The Exchanges have many roles to fill in the overall effort, bringing up the issue of potential overload. Overload may also become an issue for the linker clients of RDx.

The level of client participation in planning and managing RDx seems too low, from the standpoint of producing commitment to and feelings of "ownership" over the effort. More attention to need-processing will help overcome this, but RDx really should have begun with much greater input from the field, and this lack may now be hard to overcome. RDx will also need to do a better job of deciding just who its clients are. There are probably too few "linker" clients to justify the level of the RDx effort, but there are definitely too many potential clients for the effort to handle if RDx opens itself up to all educational practitioners directly. Linkers may also serve to filter out need statements from the field.

A SUMMARY OF RDx AS SEEN FROM THE "LINKAGE PREDICTIVE" MODEL

Here are some of the major forces we see operating on RDx, organized according to the levels of linkage predictors discussed earlier:

Societal: The key here is the societal push for KPU efforts in order to achieve some payoff for the large social investment in R&D. Note that there is not as vocal a push for R&D-based solutions coming from practitioners -- they are contending with inflationary pressures, parents and voters who are asking difficult questions, etc. Regional exchanges may be hard put to demonstrate the relevance of R&D-based solutions to harried educators or linkers who are more worried about simple survival. The evaluation of RDx must also take this into account.

Organizational: Reward systems in academic R&D appear to limit the potential contribution of many researchers in deriving useful solutions. Conversely, practitioner reward systems stress operational success, not information input -- thus, RDx will have to demonstrate to practitioners the direct benefits of information inputs on operational performance. Cost-benefit data will be needed.

Individual: Initial need-sensing steps are needed with each potential client with which RDx's linker clients work. This builds the reciprocal interpersonal relationships needed in linkage. Thus, RDx must be able to train linkers in relational processes, and must be able to change itself in response to what linkers say is needed. RDx must avoid the tendency to overload individuals in its human resource banks, Regional Exchanges, and linker client groups.

Procedural: Regional Exchange freedom in establishing linkages based on previous experiences is crucial. Supports are needed to allow the Exchanges to work through as many interpersonal channels as possible. On another level, there are no clear statements as to how RDx will link to educational policy-makers, researchers, and other stakeholders -- these need to be elaborated.

Content: Again, the key thing here is to keep RDx open to content other than that based on R&D: practice innovations, sources of support, referral services, etc., may prove more useful to many clients than R&D-based knowledge. Not only must this variety be provided (or at least linked to outside of RDx), but monitoring and evaluation must take continual account of the utility of various kinds of solutions.

RECOMMENDATIONS

As a conclusion, we propose three broad sets of recommendations derived from the analyses above. The first set pertains to the operating philosophy and image of RDx. The second relates to the operational modes which might be emphasized. The third relates to the process of system monitoring and redesign.

A. Operating Philosophy and Image.

A.1 We believe that RDx should strive for consensus among its members and relevant stakeholders concerning its operational philosophy and image. We believe that that philosophy should place most emphasis on linkage, resource brokering and problem-solving assistance, rather than on research and development products per se. Component elements of that operating philosophy might include: (a) client need orientation, (b) responsiveness to clients, (c) two-way dialog concerning needs, solutions, and reactions to solutions, (d) the brokerage role (connecting clients to a universe of resource persons, products and services), (e) providing a range of alternatives which leave the client with meaningful choice and a sense of control over the decision-making process, (f) follow-up capacity to indicate to clients that RDx is concerned not only with dissemination but with the full cycle of problem-solving and educational renewal, (g) capacity building so that clients can ultimately take unto themselves the resource linking and problem-solving functions that RDx initially provides.

A.2 RDx should work to build the strongest possible links to other linkers, brokers and consulting services in the "natural network" to demonstrate its non-exclusive and complementary functions, as well as to enormously expand its resource linking capacity.

A.3 RDx should strive in many ways to cultivate and broadcast an image of client-centered resource linking, as suggested in recommendation A.1. Image building activities should serve to allay fears of other stakeholders, and to develop a client constituency which is aware of and interested in the types of services which can be provided.

B. What Operational Modes are Most Appropriate for RDx?

We recommend that RDx planners and decision-makers review the descriptions of the eight operational modes we have presented, to determine which apply most strongly to the type of effort they are trying to develop. In making this determination they should consider the fact that it is not possible to operate well in all modes simultaneously, given present and projected resource constraints of RDx. Furthermore, an attempt to invest in too many operational modes simultaneously may confuse the image and the operating philosophy, both to your clients and to your members. Thirdly, the adoption of somewhat contradictory modes, for example "Knowledge-Based Problem-Solving Consultation," and "R&D Product Dissemination," may create role conflicts for persons and organizations within the RDx effort.

Fourthly, members of RDx who are Labs and Centers have a history, capacity, and image connected with some of these modes, e.g., R&D product dissemination, but not with others; hence, if they extend too broadly they may not be building on existing strengths, and may be acting counter to the expectations of important clients and stakeholders.

We would further make a few suggestions concerning the specific relevance of each of the eight modes as follows:

> B.1 Nurturing the Natural Network: It is clearly beyond the capacity of RDx to follow this mode completely, in fact, RDx represents only a part of a federally-funded effort to nurture dissemination capacities in existing institutions and to fill gaps between them. Another problem in pursuing this strategy is the likelihood that results will have low visibility and exhibit little short-term evidence of payoff. RDx needs such evidence to survive through its formative period. RDx should not assume that there are effective linkages among the many different natural networks which exist, however, indeed, the creation of these should be the prime goal of RDx in this mode.
>
> B.2 Continuous Flow Dissemination: RDx will require some activities in this mode to build a constituency and to build an awareness of and interest in its general objectives, and its values to that constituency. However, it seems unlikely that this will be a prime mode for RDx.
>
> B.3 R&D Product Dissemination: It should be noted that planned proactive dissemination is necessary to get the widest and fullest utilization of educational R&D. It should also be noted that R&D Centers and Regional Laboratories have traditionally and some times very effectively engaged in marketing their own products. We therefore recommend that RDx give further consideratiion to the place of and need for this mode within a total system configuration. In particular, they should consider how new RDx initiatives in other modes will relate to or conflict with past and ongoing Lab and Center activities which are clearly in this mode. For example, one might ask how "alternatives" can be posed fairly and effectively by an agent who has devoted one third or more of his or her professional life to the development of only one of those alternatives.
>
> B.4 Instant Response R&D: The major concern here is duplication of existing effort. There has been more progress in the last decade in this area than in any other in information services, and several nonmembers of RDx are proven and expert providers (e.g., SMERC, RISE, New Haven ERC, etc.).

B.5 Rapid Response Reporting: RDx needs to experiment with this promising strategy, but to be fully aware of its cost implications and the necessity of being extremely selective and strategic in the questions and clients it wishes to cover in this way. After a "free" start-up period during which the service presumedly proves its value, a gradually escalating fee-for-service schedule might be implemented. Rapid reports should also feed into continuous flow channels as a secondary market, to multiply the number of users who might benefit and to improve the benefit/cost ratio.

B.6 Coordinated, Mission-Oriented R&D: This mode is clearly outside the cost feasibility realm of RDx as currently conceived; however, through the feedforward function RDx should play a key role in a larger problem-solving loop which involves NIE, universities, private organizations, states, and labs and centers. Feedforward should serve to articulate real and pressing client needs and concerns, and should activate the organizations responsible for knowledge building activities. The fact that RDx does this (with credible examples) should be broadcast to its constituencies so that they can understand and appreciate the purpose and value of the feedforward function.

B.7 Ad Hoc User Research Services: Many people and organizations in the "natural networks" have the capability of performing such services, and many routinely do so already. Therefore, we would urge RDx not to compete in this area, but rather, to serve as a broker, especially to connect clients to unusual or remote helpers.

B.8 Knowledge-Based Problem-Solving Consultation: Although it is clear from much of the early discussion among RDx members that this is the preferred mode, RDx should be cautioned to consider the very high costs of providing satisfactory and rewarding services of this nature. RDx must be very selective, and perform very well, so that it may serve as a model for future educational cooperative extension and problem-solving programs funded by federal and state initiative. Again, RDx should operate as a broker for outside resources who can operate in this mode.

C. Monitoring and Continuous Redesign of the RDx Effort

The KPU linkage-predictive model proposed here represents a reasonably comprehensive and systematic approach to defining and modeling the functions and predictors of an effort such as RDx. We propose that some such model be adopted or adapted by RDx to understand, monitor, and evaluate itself. We further propose that such modeling efforts and data collections be used in guiding the continual redesign and self-improvement of the effort and its many elements. This means beginning with a conceptual approach which is shared by RDx and its clients, then basing evaluation and change on that shared understanding.

THE BALANCED PRODUCER-CLIENT LINKAGE EXCHANGE:
THE R&D EXCHANGE AS SEEN FROM
MODELS OF KNOWLEDGE PRODUCTION AND UTILIZATION

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PURPOSE AND SCOPE OF THIS PAPER

Our concern here it to arrive at a balanced conceptual approach to Knowledge Production and Utilization (KPU); one which gives adequate consideration to the needs and operations of both knowledge producers and potential knowledge users. Since efforts such as the R&D Exchange (RDx) are most often designed by knowledge producers rather than knowledge consumers, we will be particularly concerned with representing interests of "clients." The paper is presented in two parts. In the first we discuss KPU models, concentrating on understanding how they are affected by who creates them and what assumptions are made. In the second we will discuss RDx from the standpoint of the most comprehensive models, and make recommendations based on this analysis. We will look at the planned activities of RDx using a set of conceptual aids which we call "operational modes." Introduced by Havelock (Havelock and Lingwood, 1973; Havelock, 1974), and also used by NIE in drafting the specifications for RDx (NIE, 1977), these modes provide alternative descriptive outlines for analyzing actual KPU operations within the overall context of a general linkage model. We will also go beyond descriptions to look at RDx from the standpoint of a "linkage-predictive" model of KPU which is introduced in Part 1.

PART 1: DESCRIPTION AND EVALUATION OF CONCEPTUAL APPROACHES TO KPU

How an individual views the KPU process usually depends on where that individual is in the process. Knowledge producers, linkers and users tend to emphasize different elements, make different assumptions, or use different analytical approaches or different "models." Such conceptual individualism may make little difference if KPU is seen as natural, unplanned and decentralized. When a field attempts to alter or improve KPU through a planned and organized effort, however, different approaches become a distinct liability. There are dangers that the process may take only the perspective of the most dominant group, and thus "turn off" others from the start, or that the resulting effort may be so unrealistic that it may be unworkable (and hence ignored) by some of the groups who are keys to success. The most likely problem is that system designers and knowledge producers will have more voice in deciding the conceptual approach to be used, and that this may not fit well with the experiences and needs of potential "users" or "clients" of the effort.

We cannot claim that the development of a shared, consistent and accurate conceptual approach is a sufficient condition for success in improving KPU activities, but we feel that such development is a necessary condition for it. KPU efforts such as RDx are so complex, and the terminology used to describe them is so loose, that disagreements on goals, strategies and outcomes may not come to light early enough to be surmounted unless a common framework exists. For this reason, as well as to provide a review helpful in choosing the best model, we feel it is useful to begin by providing an overview of approaches commonly used. We will point out the assumptions and viewpoints behind them, and develop an overall conceptual framework through which persons at different points in the process, with different goals and needs, can communicate with each other and orient toward the common effort.

"POLAR" APPROACHES TO KPU

Discussions of KPU models frequently reflect a polarity of thought between those who are research or expert-oriented and those who are practitioner or consumer-oriented. Those at the research pole stress the need to be rigorous and scientific in the assessment of new programs and practices, using comparative and universalistic yardsticks. They are also committed to the value and use of scientific and informational products and outcomes. Those at the practice pole stress the uniqueness of the particular user's situation and needs and their capacity to judge for themselves what is best for them and their situation. In its most extreme form, the practice pole denies the validity or relevance of any research or development work which is not explicitly focussed on the specific need and the specific consumer group in question. Thus what works for third graders in Vermont may be seen as totally irrelevant and inapplicable by third grade teachers in a rural New Hampshire county, and so on. At the other extreme there are may be some developer-advocates of educational products who see truth only in their inventions, and who strive mightily to make them "teacher proof," i.e., incapable of being used by practitioners in any way deviant from their original intentions. The research - practice polarity pervades many of the more acrimonious debates about KPU, and each viewpoint can be conveyed in either an extremely positive or negative light. The section below articulates these extremes as "models" which have a certain consistency and rationality within themselves. The "poles" form a useful starting point or anchor points for much of our discussion of more integrated approaches to KPU, and as means to evaluate the RDx effort (in Part 2).

The Research, Development and Diffusion Approach

The "R,D&D" approach views KPU as basically a linear process. It starts with the process of basic and/or applied research, then moves into development, in which the fundamental research knowledge is applied to the solution of some real-life problem. In many cases, development activities actually begin the "planned-for" work, since basic research knowledge is usually produced already, for reasons inherent in the scientific desire simply to know, and without any intent of applying knowledge to any real problem. Once a potentially "usable" product has been developed it moves into the diffusion process: communication or transmission activities designed to inform a wide audience of the existence of the "product," and to provide demonstrations of it to the "field" of potential "users." Finally, the product is adopted by some portion of the intended audience or clientele. (See Havelock, 1969, p. 10:40, for a list of some of the key early proponents of this approach, the elements it contains, and how they are sequenced.)

Underlying Assumptions: The R,D&D approach is, first of all, what we could call an "activity description model." Note that it concentrates on successive stages of activities, paying little attention to the roles involved, who fills them, or micro-level process involved in each.

Second, the linearity assumption is important: linearity in terms of sequences of planned activities, based in rational decision-making and on empirical knowledge. The notion of linearity is not diminished by a certain amount of re-cycling which may take place among the stages; from evaluation of user impact back to re-design, for example. The key point is that product development precedes any extensive interaction with the specific "user."

Third, and related to the above, there is a crucial assumption that potential users are amenable to the rational and empirical approach, or at least that they can be "sold" or convinced by appeals to the inherent advantages of using new knowledge-based products for change. Following from this is the assumption that users know how to convert knowledge into behavior -- that they know how to "use."

Fourth, the sequence often begins with existing knowledge or technology, with the assumption that existing knowledge is relevant to the solution of some problem, or that the knowledge is valuable enough that it ought to be applied somewhere. In many cases the model is clearly an advocate for use of existing science, and is often used as a selling point for the conduct of such research. A related assumption involves the value of information as opposed to other kinds of products (services, funding, skills, political power, etc.).

Fifth, this approach assumes that the effort is best planned and directed from the top down, where "top" is defined as including the producers and marketers of information or R&D products.

Sixth, there is the crucial assumption that the KPU sequence of activities can and should be planned for, and often organized into large "systems." This ties this approach quite closely to larger, formalized efforts, particularly where producers and potential users are not parts of the same organization.

Comment: The R,D&D model has been very successful in those situations in which the assumptions are met, especially if all parts of the process from research to application are within one organization or true system, with well-meshed expectations, roles, procedures and rewards. This may account for the prevalence of this approach in military, industrial and (some) governmental agency applications. On the other hand, the very logical and sequenced nature of this approach may be one of the appeals in these instances. To the extent that the leadership of the effort is correct in the assumption that there is a working system in which assumptions, perspectives, needs and values are shared, the R,D&D approach can fit in well. The question with this approach, as with others, is (to draw a statistical analogy): how "robust" is the approach if its underlying assumptions are violated?

Guba and Clark (1974, 1975) performed a service for the KPU community by pointing out that the current "unified systems" view, closely associated with the R,D&D approach, is not realistic in education, leading to a series of failures which reduce political support for both R&D and KPU. Early efforts at "engineering" large scale R&D/KPU efforts were unrealistic, they contend, since the various groups and organizations involved did not share common perceptions of the problem, were independent, had other missions than either producing or using R&D knowledge, etc. They suggest the use of the term "configuration" as more accurate than the term "system." We think it is best to view the configurational argument as an appeal for wider-ranging models and approaches, ones which fit the "territory" better, and which must be evaluated for fit by all potential participants (producers, intermediaries, clients, etc.) before the effort begins.

If we look at the history and current uses of the R,D&D approach, we see that it is primarily a system-designer's, manager's, or researcher's approach. In other words, it does a good job of seeing the world from the perspective of the producer or promoter of a particular field of empirical knowledge. Not surprisingly, it is weakest in understanding the needs of potential users. Need surveys and marketing information cannot really overcome this lack, since these miss one crucial element: the commitment provided to potential consumers from having had direct input into the planning and development of the effort (i.e., "ownership"). The R,D&D approach too often takes a unidimensional view of the "user," as if users did little else than attend to the arriving stream of new information-based products.

The criticisms above apply especially in instances (such as education) in which many of the products come from "soft" social science, rather than "hard" technology or physical science. This distinction separates much of "research utilization" from "technology transfer," and the differences are more than semantic. In the "harder" areas of technology: (1) innovations exist independently -- they are "things"; (2) products and uses may be observed easily, with little measurement error (an hypothetical conversation brings this point home -- Researcher/developer: "I thihk you might be able to use X to good advantage"; Practitioner: "Oh, but we already do that"); (3) products do not change as they are disseminated or relayed (hybrid seed corn is hybrid seed corn, but ideas "transmute" as they flow from person to person).

In conclusion, the crucial elements of the R,D&D approach involve "product" development and dissemination in relative isolation from the inputs of the particular "user." If the product is a technology, this separation may be less important (and the approach may work better). Resistances are likely to be greater in the case of informational products requiring behavioral changes of people, however, and it is precicely here that the lack of client involvement hurts most -- willingness to change behavior is greater when the product is seen as a response to needs expressed earlier in a participative manner.

The Problem-Solver Approach

This approach makes a good polar opposite for the R,D&D perspective. Havelock (1969) provides a succinct description of it:

> Included in this school are those authors who portray the change process as one which is directed toward solving the problems of a specific receiver, and in which the receiver himself is involved throughout. Though the receiver may be able to create or find suitable solutions to his problem by himself, this school is primarily concerned with those cases in which the assistance of outside resources is utilized; these resources are likely to be individuals or groups which can generally be referred to as "change agents." The change process may be initiated either by the receiver or by the change agent, but in either case the receiver must desire to change and must participate fully in bringing the change about. The relationship between sender and receiver is one of collaboration, and whereas in the S-I ["social interaction" or diffusion research tradition] and the R,D&D models the receiver was referred to as the "target system", it is here called the "client system". (pp. 10:54-55)

In problem-solving, then, the focus is clearly on a specific client person or group, and on finding help to meet needs and solve problems for that client.

Underlying Assumptions: The most crucial assumption here is that change activities begin with a felt (or derivable) need of some specific group. This draws heavily on a learning theory approach and on need psychology: that evoking a need is a necessary condition for change, and brings about some sort of "drive" to reduce that need.

Second, the role of the helper or change agent is assumed to be that of a facilitator, need-arouser, and solution-finder; always operating in participative modes with the client. Indeed, interaction itself is a keystone.

Third, the notions of "force field analysis," and comparision processes for testing alternative solutions point to an assumption that there are reasons for the current state of need in terms of barriers which oppose change. In some situations more attention may be given to neutralizing barriers than to importing new knowledge or other products.

Fourth, the assumed attention of the approach is on process, rather than on knowledge or technology. Giving skill training, problem-managing capacity, etc., is often more important than finding specific solutions. The assumption here is that it is "better to teach a man to fish than to give him one fish" -- that, given skills, clients can solve more of their own problems in the future. Thus, the change-agent tries (in the best Peace Corps tradition) to "work himself out of a job."

Comment: In comparison with the R,D&D approach, which we may classify as "fixed" on the knowledge or potential-solution end and "open" in terms of who adopts or uses the innovation or product, the Problem-Solver approach is "fixed" on the client end and wide open in terms of which solution will be chosen. Among some proponents, even the process by which the change agent works is kept deliberately open, so as to best fit the particular group and its needs.

Key in this is the notion that information is only one kind of solution, and often a less-useful one. Information (particularly that based on R&D) is harder to use, since more steps are required, than solutions which give capacity, power, or techniques. R&D information is also only one kind of information, and is usually less preferred than non-empirical forms, many of which are available inside as opposed to outside of the client organization (see van de Vall, 1975).

In one sense the Problem-Solver approach is not a complete model for KPU, since it is not particularly concerned with problems of knowledge or innovation production and dissemination. The approach is vitally concerned with getting results and with helping, however; and it does an admirable job or capturing the KPU problem as client groups look at it. Clients often retrench more firmly into this position when they encounter KPU "systems" which cannot meet their needs.

OVERVIEW OF THE "POLAR" APPROACHES

The general conclusion we reach in reviewing these approaches is that neither of them does a complete job of describing or predicting KPU phenomena, and that each has its particular biases or set of blinders resulting from who formulated the approach and for what purpose. R,D&D is a producer's approach, while Problem-Solving caters to actual or potential appliers. In part these differences result from the selectivity of attention one must practice in order to understand even part of a complex phenomehon.

We are not downplaying the power or utility of either polar approach, however, when they are applied to situations similar to those for which they were originally created. The difficulty comes in trying to adapt them to other areas where they may not fit. The real danger is, however, that we may not know if the model fits: models tend to shape the situation to which they are applied, or at least our perception of that situation, and give no outward signs that they are missing important elements, interactions, and outcomes until it is too late -- until the effort misses in reaching its objectives, and until the complaints begin to be heard. The importance of an accurate model or approach is more than an academic exercise: models lead to activities and decisions which focus attention, effort, and dollars. A synthesis thus seems to be required; one which is comprehensive, provides a mechanism for reality testing, and yet is not complex that it cannot be dealt with and understood. The linkage approach discussed below is, we feel, a good synthesis, especially as we will expand it later.

LINKAGE -- A SYNTHESIS

Havelock (1969) presented and Havelock and Lingwood (1973) elaborated a "linkage model" of dissemination and utilization in an attempt to bring together the polar concerns of the R,D&D and Problem-Solver approaches. Linkage as a concept has been widely used since then, but it has never been precisely defined, leading to the danger that every role and KPU act might be called "linkage," to the detriment of clear understanding of what is meant.

Most simply, "linkage" is a "strong relationship between any two parties, persons, or elements." In the context of knowledge production and use, a more satisfactory definition might be "a relationship between a resource person (or group) and a practitioner (or practice organization) which continuously facilitates and promotes mutual information exchange and helping activities with respect to significant practice needs." Each of the underlined terms deserves some special note: "continuously" because linkage cannot be a one-time or fleeting phenomenon, but something which allows a continuing flow; "facilitates" and "promotes" indicating that it flects openness both in a passive and an active sense (e.g., listening and talking, not just waiting around for exchange to happen, but actively reaching out to make it happen; "mutual" in that both parties must talk to the other and listen to the other and be willing and able to reciprocate talking (or writing or presenting) and listening (or reading or viewing).

Furthermore, effective and meaningful linkage probably must go somewhat beyond the mere passing of information to some level of mutual commitment and involvement which could be called "helping;" this might be in the form of the provision of specific technical assistance or merely the offering of opinion, guidance or encouragement. Lastly, meaningful resource-user linkage ought to be focussed on real practitioner or consumer "needs," not primarily on what the resource person or group wants to provide. Defined in this more elaborate way, it is clear that "linkage" denotes more of an ideal for resource-practice relationships than a typical description of present-day reality; thus, it is as much a prescriptive as a descriptive term.

There is a cyclical nature to linkage. Havelock (1969) notes:

> The concept of linkage starts with a focus on the user as a problem-solver. We must first consider the internal problem-solving cycle within the user ... there is an initial "felt need" which leads into a "diagnosis" and "problem statement" and works through "search" and "retrieval" phases to a "solution", and the "application" of that solution. But ... the linkage model stresses that the user must be meaningfully related to outside resources. ... The user must make contact with the outside resource system and interact with it so that he will get back something relevant ... The user must enter into a reciprocal relationship with the resource system [which] ... goes beyond the point of improving individual problem-solving processes toward the creation of a stable and long lasting social influence network. (pp. 11:17-18)

Thus, the linkage between a potential innovation/knowledge consumer and outside resources (groups or individuals) is initiated by the needs of that consumer, it lasts over time beyond the particular problem-of-the-moment, and it allows the consumer to influence the provider in turn.

While linkage describes the process, it does not signify what goes on within or through the linkage. Havelock and Lingwood (1973) suggest that the dynamics within a linkage may be summarized as transmission and transformation activities:

> Starting with the user's need, the first task is to transform the need into an expression or articulated message of need. Subsequently this message must be transmitted to resourcers ... Then the need must be received and transformed by the resourcers into researchable questions, solvable problems or diagnostic statements. The solution outputs then must be transmitted back to the user ... and finally they must be transformed again by the user into actual solutions or need reductions through his testing, consumption, or integration efforts. (p. 81)

Linkages, then, are complex exchange interactions. Havelock and Lingwood (1973) identified functions performed in six components of linkages at the system level. The six are: user self-servicing, need processing, solution building, solution processing, micro-system (interaction) building, and macro-system (overview/monitoring/control) building. We will not specify each of the functions here, other than to note that each of the functions involve transmission, translation, definition, and behavior components. The analytical framework is shown in Figure 1.

[Insert Figure 1 about here]

Linkages may be face-to-face or, particularly in large, dispersed efforts, indirect. In the latter the partners operate through "mental images" of their linkage partner. To the extent that the mental images diverge from the realities, linkages will be less effective. In other words, linkages may be seen in terms of person- or organization-perception, and the accuracy of these perceptions affects all components in the Figure.

Evaluating the Linkage Approach

The linkage model benefitted from an integration of the perspectives and research which were available within the earlier KPU models. It has been used in both research on R&D systems (Lingwood and Morris, 1976), and user and change agent training (e.g., Havelock, 1973; Havelock and

Havelock, 1973), and it has proved useful in both situations. Still, the utility of the model appears to come from its very breadth, and perhaps to some extent from earlier lack of explicitness of the concepts, which allowed each student of the approach to read into it what he or she wanted. The very comprehensiveness of the approach may also hinder its utility in specific instances. The approach also was proposed by researchers who were also interested in action and change, but it still must be noted that the authors are researchers. Finally, this approach is more descriptive than predictive. Though there have been several attempts to identify factors which promote linkage (e.g., Havelock, 1969, pp. 11:20-32; Havelock and Lingwood, 1973, pp. 294-306), these factors are not a part of the model itself. The approach concentrates on the linkage-related functions of roles and organizations, without integrating these into other non-linkage activities.

As with other models, linkage also suffers from the tendency to choose criteria of convenience: selecting those things we can measure most easily in determining effects and outcomes. It is easier, for example, to measure dissemination or transmission activities than to determine actual use or impact of either innovations or needs.

We feel there is still great potential in the linkage approach, particularly for RDx. Elaboration is needed, however, particularly in the areas of: (1) development of a causal/predictive context for understanding and developing linkages, and (2) specification of exactly what we mean by linkage and its predictors (i.e., to insure that the predictor concepts are not subsumed within the linkage definition itself). We will begin this process with the "linkage predictive model" introduced below.

A "LINKAGE- PREDICTIVE" MODEL

Our basic classification of predictors comes from: (a) the notion (supported by the work of Guba and Clark) that a predictive scheme must be sensitive to cross-system differences or incompatibilities in basic goals, independent or uncoordinated activities, lack of central authority, etc; (b) that linkage is affected by the characteristics of each system and the linkage "partners" who come from these systems, in addition to the effects of the linkage situation or medium itself; (c) that linkage takes place between the partners, not inside the systems. There are several sources of information which we will combine in setting out the nature of these various predictive forces. First, we have available theory and model discussions (e.g., work of Havelock, Guba and Clark, and others). Second, we have reviewed sources such as NIMH (1971), coding predictive forces.

We think it most instructive to classify types of linkage predictors according to the following rough levels; (1) societal; (2) systemic, organizational and inter-organizational; (3) individual and interpersonal; (4) procedural; and (5) content (type of innovation or information transmitted). Let's take each of these in turn, to identify the important predictors we have found which relate to the probability that linkages will form, the process of linkage, or the ultimate effects of linkage.

The Societal Level: Here we are concerned with direct effects of societal forces such as regulation, law, support, etc., rather than the indirect effects societal factors may have as organizations and individuals attempt to operate based on their perceptions of societal factors. At one level we hear that the general "social climate" either favors or inhibits change, and this can be seen on the large scale if we compare whole societies (cf. concepts of traditional culture). "The temper of the times" as a factor also alerts us to the fact that innovation may be easy or difficult in different periods of history: the broad sweep of which has, in western society, been toward lower dogmatism and easier change. Within short time periods we see differences based on more transient economic factors and the somewhat cyclical or even faddish shifts in the focus of societal concern (e.g., civil rights, environment, womens' rights, energy, etc.). In the present case of education, we see direct governmental and social intervention in both the level of support for this most visible cultural "cutting point" and the push for those areas in which the cutting should take place. Ironically, societal concerns may well have changed about the time the educational system begins to turn out individuals skilled in the areas of social concern which were pushed for earlier.

The sector of society which provides R&D solutions is also subject to societal/governmental/political factors, especially now in the days of "big science," when mission and program orientations coming from the government influence the type of R&D which will be conducted (and demand greater relevance as a result). It is not the case that R&D truly looks ahead to many alternative futures, having knowledge on the shelf no matter what the direction of societal concern. R&D is subject to time cycles also, and the concerns may have shifted before the results come in; and the R&D time cycle is often longer than that in educational practice.

There are two kinds of predictors we need to identify at this and any other level: those which affect both users and solution-providers equally, and those which affect one potential linkage partner exclusively or primarily. At the societal level we might find that a "tight" economic picture limits both the ability of R&D and action agencies to produce solutions and the ability of educational practice to innovate. Alternatively, funding might simply shift from R&D to delivery, thus affecting only the solution-providing side.

In summary, the societal level provides a definition of, or sets priorities for, concerns at the basis of KPU processes. Government provides resources and serves either to mandate or facilitate linkages (or non-linkages). Political and social processes at the local level affect the educational user side primarily -- a particularly pressing issue at the present time, when many local forces are pushing for a return to the "basics," when millage elections fail repeatedly, and while at the same time solution providers are pushing many potential innovations.

The Systemic or Organizational/Inter-organizational Level. The organizational characteristics and processes which affect linkage and change look very much like principles important in modern organizational theory. This is no surprise, since organizations do not exist in a steady state, and to be effective must be able to change rapidly and efficiently when conditions warrant. Few ties have been made between organizational and KPU theory, however. Perhaps few organizational theorists have looked at KPU since knowledge (particularly empirical knowledge) is only one stimulus among many from the organizational change perspective, and is often less powerful than leadership mandates, economics, etc.

The following issues, again factors which look very much like elements in theories of effective organization, are important in predicting linkage:

goal clarity and decision-making processes to achieve it; systematic, planned processes of action

committed leadership, leadership openness, skill and support

participative processes for problem formulation, need-sensing and decision-making

financial capacity, size and stability

organizational climate supportive of change, cohesiveness and an "error-embracing" (Michael, 1973) approach to planning

an organizational structure compatible with change

positive collective attitudes and motivations of system members

security, and reward based on change-responsive performance

perceived benefit of change.

Lingwood and Morris (1976) found that these factors were very important in the ability of an R&D organization to help its members make contributions to applications of knowledge in addition to the cumulation of knowledge itself. Thus, these factors affect the ability of producers to produce useful information as well as the ability of clients to make use of it.

Inter-organizational linkages will form and endure only to the extent that they are seen as beneficial to each organization. In the case of R&D, if the researcher is rewarded only for journal publishing, and the goals of the organization are seen as tied into producing new knowledge rather than helping others use it, then few application linkages are likely to form. On the other side, if the attention of potential client organizations is set on simple survival, and if little leadership support and payoff is put on looking outside for solutions and expertise, then again linkages are not likely to form. Perceived benefit may be the most efficient shorthand term for this predictive force.

Factors internal to organizations control inter-organizational relations leading to linkage, as well: openness to outside help, ability to lead and teach lay/community power figures while being flexible in regard to demands made on the organization; and a skill base among those who will be involved in linkage, or the ability to give those skills. Many of the most successful inter-organizational linkages come during problem-solving approaches in which the traditional tactic of searching for a higher-level or super-ordinate goal is used.

The Individual Level: In one sense, individual predictors mirror organizational ones: receipt of what is provided (e.g., training, perceived influence, help, peer support), response to initiatives of the organization, reaction to climate factors, views of change, etc. Behind this are personal knowledge, attitudes, and behavioral skills relating to linkage and change. Important among the attitudes are innovativeness, risk-taking, tolerance of failure, openness to experimentation and empiricism, low anxiety, reality orientation, etc. Skills include interpersonal relations, problem-solving, etc. Some personal characteristics relate to the above: education and training level, experience (though the literature is mixed on this), and so on.

Individual characteristics also affect and are affected by the linkage itself, as it forms and matures. One of the key ingredients here is the type of problem-solving process or general interaction style used by the linkage partners over time. It is difficult to specify these factors briefly, since we would be entering the fields of dyadic interaction, interpersonal attraction, and exchange theory. Furthermore, many of the training approaches used in change agentry stress the interaction skills and techniques, both from the perspective of what the partners should bring to the interaction, and what should emerge within it. Over time, the linkage perspective would stress reciprocity as the key element, tieing in closely with the notion of linkage as exchange. At some point it becomes difficult to distinguish from the individual and the procedural factors below.

The Procedural Level: Here we are concerned with predictors which come from the nature of the communication or linkage media used, and from the ongoing linkage experience itself. In one sense "media" is indistinguishable from the concept of "process" (as change agents use the term). One key element is redundancy in the linkage media or processes themselves. Multiple, synergistic approaches have the advantage, as strategies for overcoming information losses in each channel -- the famous "failure to communicate." Repetition is one form of redundancy, and the interpersonal media allow repetition with clarifying modifications, based on feedback (e.g., the questioning look or shake of the head) from the linkage partner.

The diffusion research tradition points to the need to fit media with messages. Interpersonal media seem best for making "entry level" contacts, establishing rapport and accurate perceptions of the partner; they fit in well to establishing needs and goals. The impersonal media seem most efficient later, in providing specific data once momentum and processes have been built.

The Content Level: Important here are factors inherent in the particular innovation or information being transmitted in the linkage. Much of the concern rests with the concept of "innovation-organization fit." Advantage goes to those innovations or messages which: are lower-cost overt processes; are of high quality if an R&D product; merge well with existing procedures, organizational structures, theories and styles; have an enduring influence, yet may be discarded easily; and are self-supporting in providing assistance in adoption. The difficulty comes in keeping this list of characteristics of "linkable content" from defining messages or products which are trivial in nature: the search for "painless" innovations often produces ones which are not worth the effort.

Putting the Model Together

Figure 2 shows one way to integrate the predictive factors we have been discussing. Influences flow downward from the societal to the individual level, as well as to the linked systems and elements (persons, groups) involved in the linkage. Though the model shows a formed linkage, we need to remember the the predictors also relate to the probability that a linkage will form in the first place.

[Insert Figure 2 about here]

There are mutual effects between organizations and individuals, allowing the linkage partner to have an effect, and to be affected by, the supporting organization. Procedural and content factors are also interpreted by linkage partners in the context of the organization from which they come.

While this diagram identifies broad types of predictors, it does not show the *dynamics* of how they operate. The dynamics are crucial: any approach which simply lists classes of predictors or gives a "checklist" also misses this point. Such an approach also would fail since it would contain no way to consider more than one or two factors at once -- it does little good to represent a complex, multivariate predictive relationship or large "system" using methods which blind us to that very complexity. In Appendix A we present a statistical model which may be used as a rough starting point for further refinement of this approach.

We propose that the predictors may affect linkage in one of four different ways:

(a) as external forces which affect both linkage partners and their organizations equally, but which may vary from linkage to linkage

(b) as forces which affect one or both linkage partners, but are unrelated to each other

(c) as forces on which the similarity of the partners is crucial ("homophily"), and

(d) as forces on which the partners must be compatible, but not necessarily similar.

Points c and d are the most important and complicated, and quite a bit of attention is given to defining these in Appendix A.

Comments on the Predictive Model

This model also has its assumptions, biases and weaknesses. Perhaps the most important assumptions are that the mutual perceptions and interrelationships of linkage partners are crucial in KPU; and that KPU is an exchange relationship. "Exchange" assumes that both partners are affected by (i.e., change as a result of) their experiences. Thus, the concepts of individual and group openness to change are important for both linkage partners. Also, this approach assumes that it is possible to capture the dynamics of KPU situations operationally using methods more powerful than simple case-study descriptions. Related to this is the assumption that statistical methods are now powerful enough, and that we can specify observable quantities accurately enough, to make this complex model work. Further, the approach assumes linear multivariate causality and the flow of predictor forces, rather than wholistic or gestalt interactions of forces.

The approach may prove difficult in situations in which linkage activities are handled by many different groups. This is basically a methodological problem in observing and collecting needed data, however. Moreover, the model requires us to look behind the scene, behind the more easily observed descriptions of linkage activities; it also requires us to extend our analysis over time. We need to remember, however, that the analytical difficulties are not caused by the model itself, but by the complex realities the model tries to capture.

In Part 2 we will use this model to evaluate the different "operational modes" which have been used to describe RDx plans and activities. The model will become a testing point for the extent to which each operational mode is helpful and fits with the background realities of KPU in general and educational KPU in particular.

PART 2: EVALUATING RDx FROM THE LINKAGE VIEW

INTRODUCTION

Our discussion of the polar KPU models and the linkage synthesis in the previous section provided the definition of terms, overviews of predictive factors, and the general conceptual approach we bring to the task of evaluating the RDx effort. Before we can begin this evaluation, however, we need an "interface" between the KPU models and the plans for RDx. KPU models are necessarily abstract, made so by the scope and complexity of the phenomena they cover. We will translate the models into more operational terms through use of eight "operational modes" for KPU, modes which were themselves derived from KPU models. Since the modes are primarily descriptive, however, they cannot provide the needed perspective of predictors of linkage; therefore, we will also explore the important background factors operating on that mode in the context of RDx.

When we have finished with the individual operational modes, we will go on to summarize from three perspectives: (1) from the characteristics of all of the operational modes; (2) from the many linkages planned for RDx, and (3) from the predictive perspective. After these discussions we will include a section covering the overlaps and disagreements we see between our approach and those of the other RDx authors. Finally, we will draw all of this together into a series of recommendations for the RDx effort.

THE OPERATIONAL MODES

A great deal of the confusion which enters discussions of linkage and KPU functions generally arises from the fact that different discussants have very different systems and functions in mind at the operational level. For example, a very specialized information service for a very specific and limited group of clients, e.g., instructional materials and aids for teachers of deaf children, will be vastly different in operational terms from a general information and referral service, even though the same linkage principles and terminology apply to both. In an attempt to clear away some of this confusion we have proposed (Havelock, 1973; Havelock and Lingwood, 1973) eight alternative operational modes to describe KPU systems. Although each mode fits the linkage paradigm, the specific referents are different, sometimes radically different. Consequently, any attempt to make comparisons becomes an absurd exercise. The arena in which RDx will operate makes a good example of this: RDx is in part an effort to bring together the dissemination activities of several different organizations, each of which has been working in its own operational mode or style for several years, serving different clients with different conceptions of service, offering different lines of products and/or services, within different time frames, etc.

To anchor this discussion, we can first identify the two modes which represent the extremes of specificity and globality for KPU systems: on the specific end, we have the "Coordinated Mission-oriented R&D Program (or Project)," a highly integrated linking of specific researchers/developers and clients over time. On the other extreme is the "natural system or network," dealing with those organizations and interactions which have existed and now exist. RDx plans activities at each of these extremes, as we will see below.

On one hand, regional laboratories and centers have, in the past, engaged in programmatic R&D, come of it following the complete closed loop approach represented in the "Coordinated Mission-Oriented" mode (Mode No. 1);

Wisconsin's Individually Guided Education (IGE) program might be cited as one of the most positive examples. On the other hand, with the formation of RDx, these same labs and centers are now setting themselves up as a generalized resource system, drawing upon the entire knowledge base of educational R&D. The "natural networks" are important adjuncts in any of the efforts.

The specific/global dimension is not the only one on which the operational modes, and the KPU efforts they describe, may be ranked. Perhaps more important is the dimension of client orientation, the extent of input or control clients have over the processes and products of the effort. This is the dimension we will use below, arraying the operational modes from the least to the most client oriented. In other words, we will work from those with the most remote need-sensing (disjoint in time and normative), to the most interactive ("synchronous" with solution delivery and individualized). On this dimension the "natural network" offers the least client-oriented capabilities, and "problem-solving consultation" the most. In many ways these parallel stages of KPU development; but many modes are alternative ways of accomplishing given objectives, not sequential steps all of which need be taken. After presenting all of the modes we will explore the notions of developmental steps in more detail.

As we discuss each mode and the plans RDx has for it, we will also bring in the linkage-predictive model, specifying those background forces which appear crucial to the successful operation of this mode, or which may form substantial blockages to its functioning.

The "Natural Network" Mode

Description: This mode uses interconnections and information flows which exist among the various knowledge producers and among the various practitioner and consumer groups. This "system" includes all the knowledge produced by researchers and developers over all the years that R&D has been performed. It includes government and private sector actors, private enterprise, R&D labs and centers, universities, professional associations, libraries, resource centers, and sundry information services. One view of appropriate government action and intervention in the information field is that of nourishing this natural network, building capacities, filling gaps, strengthening the weaker elements, and facilitating interaction among the various elements. These elements should not be thought of as a "system," if we are to follow the cautions of Guba and Clark, since the very diversity and multiplicity of these elements almost guarantees that they will differ widely on goals, procedures, approaches, needs, rewards, skills, etc.

It is important to note how vastly different this "natural network" is from any of the more coordinated modes we will discuss below. The users and the knowledge producers in this mode are many and varied; and the channels used will also be diverse.

RDx Plans: Natural networks are important background factors, and RDx will, according to NIE (1977), "...concentrate on strengthening these channels and making sure that high-quality R&D outcomes and exemplary practices are available." Given what we have said above, we doubt that this "strengthening" can be brought about by providing information alone, or even primarily. Strengthening will have to take the form of reducing or neutralizing forces which now limit each two-way linkage. Of course, the assumption in the quote that R&D outcomes and practices are the materials needed also requires testing. Many of the two-way linkages probably are carried on with very small components of R&D/practice information. Policy and practice groups, for example, probably spend much more time on political and requlatory matters. And again, the nature of the natural network approach requires that analysis not be limited only to the more visible linkage between R&D and practice.

Predictive Factors: In one sense, it is hard to apply the predictive model here, since the level of "linkage" is so low across most of the natural network boundaries that there is not much linkage behavior to analyze. Natural networks such as exist have certain advantages in terms of the societal and organizational factors relating to start-up and funding -- they are simply already there. Key elements in prediction are, however, the magnitude of differences among the many relevant organizations and groups, each of which will have much stronger internal linkages than external ones.

The "natural network" mode certainly has cost and timing advantages: it is easier to chink the holes in the wall than to build a new structure; further, the organizations and channels already exist, so they are relatively familiar to their users, and start-up and training time is minimal. On the other hand, one has to answer one simple but often painful question: if the natural networks are so attractive, why aren't they doing the job in the first place -- why do we need to get involved? There are probably very good reasons (organizational, political, financial, interpersonal, value-related, etc.) why there are "holes" in the natural network. Further, by assuming that there is a network we may blind ourselves to its level of efficiency -- which is likely to be low where "linked" organizations or sectors differ extensively on goals, procedures, etc. Finally, those who are linked across the most divergent sectors are likely to be atypical (such as the grade-school teacher who attends the researchers' convention), and the network may have little ability to expand further.

It is important to use the natural network as a starting point for analysis, if nothing else. The type of analysis must be more than a simple description of the linkages which now exist; it must probe into the reasons and rationales -- in short, it must use the predictive approach to understand why things are as they are. This means that each of the possible two-way linkages between organizations or sectors must be analyzed separately (e.g., R&D-practice; R&D-policy; policy-practice). These analyses will probably have to stop short of including the interpersonal and individual predictors, since this would require an excessive level of probing and data collection, much of which might be objectionable to those involved. It is certainly not possible to do this analysis here. We would suggest, however, one possible process for it: representatives from each group could be brought together in separate sessions, each geared to analyzing one of the two-way linkages. The agenda would be to describe the current linkage, and to suggest reasons (classed by societal, organizational, procedural and content levels) for the current state of the linkage. A high degree of group process skill would be required to conduct these sessions. The literature will offer other suggestions, as well. Even if the KPU effort is planned to be something entirely new, paying little attention to the current networks, this analysis is required to get an understanding of the current dynamics and environment within which the effort will have to compete, serve, and make improvements.

Comment: If we may characterize the R,D&D approach as somewhat "authoritarian," in its stressing of planned and orchestrated effort and on empirical bases for solutions; and if the Problem-Solver approach is thus more "democratic" or participative in the control it affords to clients; then, the "natural network" mode might be classed as laissez faire. If the past operations of the natural networks have still resulted in enough unmet needs so that extensive added activities are contemplated, as in the case of RDx, then it is probably the case that many changes would have to be attempted to make the natural networks responsive; i.e., they would have to be made "unnatural." Thus, these available factors seem best suited as additional communication channels through which to publicize the RDx effort, and which may pick up a few producers or practitioners who might otherwise be missed; but these networks cannot do even a moderate part of the effort themselves.

It is important to work within the many existing networks formed among similar people and groups: producer, policy, practitioner communication nets and "invisible colleges." Within a given group these will contain the most current thinking and ideas, linking the top people, and will serve as a rapid access to group consensus-building about the work of RDx. In this sense, then, the natural networks are crucial, but the underlined "s" reminds us that there are many of these, and that there are likely to be few extensive inter-network linkages.

One of the natural networks deserves special attention -- that one linking practitioners in the field. The state-to-state information and resource exchanges, to be coordinated by the Regional Exchanges, will be a helpful entré into these. The solid support of this network will provide needed legitimizing of the RDx effort. It is also especially important to use this network in need-sensing and evaluation and monitoring. To the extent that this component of the natural networks comes to have an active voice in deciding policy and directions for RDx, then the natural network mode would ultimately contribute to balance, and this mode would operate in a client-oriented manner.

Perhaps the most useful posture for RDx in relation to these networks is not so much nurturing them in the inter-network sense, as in culturing or courting each of the many existing networks separately.

Continuous Flow Dissemination (Mode No. 6)

Description: The most minimal mode in terms of KPU effort beyond the natural network could be called "Continuous Flow Dissemination." This includes dissemination in its most traditional and popular form through production and distribution of information via one-way, essentially non-interactive media (usually printed). Both wide-distribution mass periodical channels and selective dissemination of information (SDI) are used. The "targetting" for the SDI component comes from the interest and need profiles of those contacted in the mass media phase. A good example of this mode would be the tear-out card contained in technical periodicals, through which interested readers select things about which they would like more information. The returned cards are filed for future targetted communications. Note that the need-sensing component so crucial to the formation of strong linkages is included here in a style we might term "asynchronous and individualistic:" profiles are collected from individuals, and are used to determine what is sent them next (i.e., at a later point in time). Individuals have no control over what is initially offered, however.

RDx Plans: Operations Support will be involved in publicity functions. Newsletters and other broad-circulation publications are planned, and may be targetted, based on user needs and interests.

Predictive Factors: The key point here involves the pool of potential linkers: only those who receive the mass media messages and who are interested enough to respond with profiles enter the SDI phase. Since the knowledge-producing component does not enter directly into the interchange, there is little opportunity for reciprocity in the sense of affecting the knowledge base itself, though the dissemination formats are likely to be influenced by client reactions. Thus, those forces which affect producing systems are likely to remain unchanged by the effort, while procedural and content factors may change -- but only at the medium and format levels, not at the level of the knowledge being transmitted.

Comment: It is important to consider the various filters which operate in this mode. First, the mass media must reach the right individuals, making media selection and design very important activities. Second, the individual must be sufficiently "grabbed" by the content so as to respond with a need or interest profile. Thus, this mode does little to stimulate concern and need if none is perceived by the individual or group. Third, the need responses must fall within the scope of the information available now and in the future. There is little or no provision here for handling needs or interests which are, from the disseminator's viewpoint, out in left field. If a component could be added which would monitor the need profiles, and become an advocate for the "left field" needs through contacts with policy, program and R&D personnel, then this mode could be used to advantage; it could go beyond the "cast a broad net" approach to catching individuals and groups who may not have learned about RDx through the more central activities.

R&D Product Dissemination Service (Mode 2)

Description: This mode (see Figure 3) assumes the existence of a reasonable inventory of validated R&D products "on the shelf." The problem thus becomes one of getting them off this shelf and into the hands of the specific educator best able to use them. The approach here is one of advertising or marketing, seeking the best means of publicizing what is available, displaying, demonstrating, adapting, packaging, and providing technical assistance upon adoption. Always, however, the focus is on the product; its validity and utility are taken as givens. Reassessment of the fit between current needs and products is done, before and during screening for quality. After transformation, both mass media and targetted channels are used, the latter leading to demonstrations and consultation activities.

[Insert Figure 3 about here]

RDx Plans: In the past, most educational labs and some centers followed industry's practice of setting up a marketing and sales division, separate from professional R&D staffs, to handle dissemination of their products. One might logically have assumed that the establishment of the RDx signalled a merger of these various efforts into a single marketing operation. It is clear, however, that RDx now is envisioned in larger and more varied forms, covering several other operational modes in addition to this one.

Several RDx activities fit here: "...searching for products, screening and reassessing them, and transforming them for communication or transfer to users. They [the contractors] will also assist other linkers in disseminating the products through awareness activities, demonstrations, direct consultation, and monitoring" (NIE, 1977). Dissemination is a major part of the work of Exchanges; for example, finding information resources, building regional resource exchanges, and adapting and distributing materials. The important step of quality screening will be done by Operations Support, while R&D Interpretations will analyze available products and transform them as needed. R&DI will work primarily in the "high-priority" topic areas, however.

Predictive Factors: The key issue here involves those factors which affect accurate need-sensing or become active if the available R&D base does not meet the "current reassessment of need" included early in this mode. First, RDx contains very long need-sensing "paths": practitioners to linkers to Regional Exchanges and/or contractors to Operations Support and R&D Interpretations (where quality screening and packaging of priority topic information will take place).

These two latter groups will need high organizational capacity levels to cope with, we suspect, often competing need messages. Need surveys will provide general and normative statements and priorities; the REs will report specific needs of individual clients. The result may be competition between the two goals of working on overall priorities and servicing the REs and their clients in the short run. The REs will probably find themselves handling many of the specific needs locally to save time, perhaps paralleling the work of R&DI; and this may serve to desensitize R&DI to some areas of need (since they won't hear much about them anymore).

Perhaps need processing is too diffuse in RDx to be able to garner the necessary level of expertise and commitment in any one component.

If current needs do not match what is available in the R&D base, then R&DI will be somewhat pressured to move beyond the transformation role to synthesize or even create its own relevant knowledge.

A related issue becomes, then, how RDx as a whole will influence R&D funding policy to alter the knowledge base. This is beyond the scope of this operational mode, however.

We see relatively fewer issues on the dissemination side of this mode, primarily since RDx has been carefully tailored to include many different delivery channels and procedures, and attention appears to have been much more on dissemination than on need-processing. Effective coordination of the multiple activities is a very important issue, however, as is the integration (vs. competition) with existing services. Most of the important background factors here appear to be organizational, relating to the dissemination goals and "territories" of both RDx component organizations and outside providers (e.g., ERIC). The two issues interact: a clear, coordinated overview is needed to affect integration of services.

Comment: In summary, if less attention is given to need-processing than to delivery, and if delivery functions are diffused among many organizations, roles, and linkages, it may be difficult to see this mode in operation, or to trace its effects at times, even though it probably will be carried out. Current need reassessment is crucial here and in many of the other modes; and plans of RDx do not appear as well formed in this area as on the delivery side. The multiple roles of REs and others may interfere somewhat with this reassessment. The mass media functions in this mode will serve as a broad net to bring in persons not in the primary, identifiable client set. Finally, we need to remember that SEAs, linkers, etc. are not the ultimate client in the educational change process, and that RDx is heavily committed to and dependent on the "intermediate" clients in gathering need information, following up on delivery and adaptation of products, and for evaluation of impacts. Ultimately, given the multiple channels in use in this and the other modes, it may not be possible to establish clearly the impact of the effort, and this must be considered in developing the criteria by which RDx is to be judged.

Instant Response R&D Retrieval Service (Mode 4)

Description: The emphasis here is on accessing the knowledge base as quickly and as efficiently as possible for any and all requestors. Such an approach makes maximum use of contemporary technology such as on-line computer searching, telephone access to specialists who negotiate questions with requestors to define and redefine the request, etc. These activities are indicated in Figure 4. In such a mode an R&D service would typically provide information only, not products or technical assistance, and the information would be delivered "as is," i.e., without summarization or interpretation. Special packaging may be used for frequently-requested topics, however. To a large extent, the ERIC system and particularly the various clearinghouses have evolved over the years to provide this type of service, collecting and banking large quantities

[Insert Figure 4 about here]

of R&D information in print form with remote terminal access, either through the clearinghouses or through commercial vendors.

RDx Plans: One RDx ambition is to provide this type of service with regard to educational R&D products, merging the service with other functions such as training, interpretation, and some limited types of technical assistance. On the other hand, RDx does not wish to duplicate the operations of ERIC; but will provide clients with training and access to ERIC.

In addition, the Regional Exchanges will provide regional R&D resource centers, which operate in this mode in a limited geographical area. Many Labs already have capabilities for searching the available bibliographic data bases.

Predictive Factors: Since the emphasis in this mode is on timely response through the "hotline" approach, the crucial predictive elements are those which particularly affect rapid need-gathering (in the form of requests), routing, retrieval, and delivery. Key elements thus include the skills and empathetic ability of the operators, and their ability to send appropriately reworded requests to the best spot or data base. In RDx this mode will be used primarily in an informal manner in the REs, so we are talking here about the quality and number of interface staff the REs will have available.

Past success with such operations is a strong predictor of future use. This implies that (1) the effort will grow around those whose needs are well covered in existing data bases; (2) that special attention must be given to doing a good job on requests from first-time requestors; and (3) that familiarity with the procedures on the part of the client and operator is needed. Here operator training with simulated requests to test the process and the limits of the mode would be useful, and client training and access aids are imperative. Also, the more direct experiences operators can have in the field, to learn clients' perspectives, the better they will be able to interpret requests. Perhaps they might visit requestors later, to follow up the outcomes of the request.

Human resource banks and expert pools are part of both this mode and of RDx plans. Past success and familiarity with particularly good persons could lead to their becoming over used and over extended, however. Also, good people tend to be busy on other things, so there will likely be some necessary tradeoffs between availability and quality. Client closeness to the expert is helpful in establishing these linkages, both in terms of ease and cost of access, and local knowledge on the part of the expert. Skill/resource banks kept by the REs thus become very important. Also, "experts" who are also practitioners will have a "homophily" edge; and again, this points up a need for REs to widen their expert bank to include helpful and innovative local practitioners. Some work will be needed in strengthening the rewards and recognition such practitioners receive for helping others, however.

Comment: This mode is a compromise of the notion of true client-orientation, since (1) the range of possible help is "fixed" to what now exists in the information or resource banks, and (2) the client has no real ability to influence the contents of these resources. As a result there may be no true linkage here, in terms of the definitions we introduced in Part 1. This approach works well where R&D has useful information to provide, and where the scale can be kept small and interpersonal, at least between requestor and operator. The regional level of

RDx will help control the scale problem, but we need to realize that there will be many requests for which available educational R&D will fail to provide satisfactory answers. When this happens, special procedures will have to be brought into play, to link the requestor to those persons or resources which can help.

The Rapid Response R&D Report Service (Mode 5)

Description: This mode is similar to mode four, but with more depth and composition of responses. State-of-the-art reports are tailored for each client by "writer-experts," as shown in Figure 5. This mode places information providers in a far more interpretive and integrative role with respect to the knowledge base. User needs are carefullly articulated in dialog with the service representative, and then become the basis for analytical review papers which summarize existing knowledge on the subject, provide interpretation and application suggestions for the particular need and the particular user situation, and case the whole in a brief, highly readable document. Such a mode places very high demand on the skills of specialist-writer-dialogers, and assumes a reasonable backlog of good research knowledge on the topic. It has the unique advantage of providing users with concise, absorbable, and carefully thought-out information in a form which is reproducible and widely disseminable within the client system. Thus, this mode has special value as a service to decision-makers in high positions who not only have a need to understand, but a need to justify and explain to a much larger audience of staff, parents, students, and constituents. It is thus not

[Insert Figure 5 about here]

surprising that this mode has been most successfully realized in the Congressional Research Service, which provides on request rapid (two weeks maximum), substantive, interpretive, balanced, and brief reports to all senators and congressmen on any subject. In large part, this mode does staff work for its constituents, and it is not surprising that it is fostered in situations where the clients have high levels of power and resources, allowing them to tailor the information interpretive service to their special needs.

RDx Plans: High priority areas will be given the level of attention to the topic typical to this mode, particularly in the reviewing and synthesizing functions. R&D Interpretations will work on these priority areas. Tailoring may be a bit less precise, since there is no small and vocal client group, but rather, a normative picture of the needs of larger groups of clients at a further distance. Certainly, when the products of the integrative/interpretive efforts are relayed by RDx to top decision-makers, the effort will be operating in this mode more closely (in terms of relating to a small and powerful client).

Predictive Factors: This mode contains mechanisms for policy review geared to affecting future R&D. The issue is, then, who in RDx will be involved in this step? Possible role conflicts exist if the same individuals or groups operate in this mode in respect to policy-making clients, while at the same time producing materials for practitioners. In general, however, we do not see that RDx will operate in this mode to any great extent, and certainly very little in respect to practitioners -- the power relationships are not set up to give practitioners the kind of control and leverage over the conduct of this work which this mode needs.

In the sense that the work of R&DI in producing interpretive and integrative materials geared for clients falls into this mode on the production side, there are some additional predictive issues which emerge. First, there is the factor of distance of the expert-writer from the practitioner clients; this may introduce interpretive difficulties, unclarity about media and presentation factors, etc. We suggest strong procedures to get writers into the field to increase their knowledge of needs, uses, media preferences, language, etc. The ability to acquire this knowledge of practitioner clients may be reduced if R&DI moves into this mode in the sense of communicating for central policy-makers. Second, there is the issue of how to define priority areas to receive this detailed treatment. R&DI may have capacity problems in trying to do too many topics, but this is countered by potential client perceptions of irrelevance if too small or too broad a set of topics is chosen. Need statements will have to be normative, rather than individualistic (as is the case with powerful clients). The only good way to get client acceptance of normative needs or "committee" priorities is to publicize the whole priority-setting process early, so all can see the outcomes later, even if the particular product is not directly relevant to needs of some specific individuals. As long as clients know that the process is an iterative one, with new priorities chosen for the next sequence, they will realize that they have a chance to have their needs served later.

Comment: RDx, then, has some activities which can be identified as falling in this mode from the standpoint of the interpretive process; but it has no clear plans to operate in this mode in respect to decision-maker clients at top levels. It is unclear whether this mode can truly function if the client group does not have the type of control and power that, say, a Congress has over CRS. It is doubtful that any practitioner clients will see the work of R&DI as "staff work" for them, given the national scope and normative need approach R&DI will have to use in deciding on topics for work. Much of the attention of R&DI should go, therefore, to field linkages and publicity which will increase perceptions of openness and service.

Because of the attention to detail and interpretation, this mode is an expensive one to operate for specific clients. The expense is partly related to the amount of client-tailoring, and partly to the investigative nature of this mode which allows writers to move beyond what is provided in the R&D data base. This introduces the issue which is at the heart of most KPU efforts: the "cost/helpfulness ratio." The most helpful solutions are those which are specifically tailored, worked out in close interaction with the client, interpretive and procedural. This is costly. Most KPU efforts put great energy into simulating this kind of service on a larger scale. About all we know about this ratio is that it is there, however. There are no studies which look at the KPU problem this way, or which compare and evaluate alternative methods which have been or might be used.

The Coordinated Mission-Oriented R&D Program (or Project) (Mode 1)

Description: This mode represents a specific response by a particular R and/or D team to a specific practice or user need (Figure 6). The project might be large or small and might occupy a time frame as short as

[Insert Figure 6 about here]

six months or as long as six years; the important point is that this represents a closed system approach, typically specified in a contract with a government agency defining the terms of the contract, to include how the results of the project are to be communicated and implemented, by whom and for whom.

This mode can also be used in smaller efforts, when client, need, and providers are well identified and closely linked. In both instances, however, the emphasis is on the quality of the R&D product (frequently because the stakes are high), and on high relevance of that product. Examples of this mode would be the pilot experiments on the negative income tax, rent subsidies, and "Sesame Street."

Because of their national visibility, high news value, salience of the need, and the specificity of the solution, utilization of findings from these studies is often not deemed to be a major problem. Changes resulting from these efforts often come more through administrative or legal enactment and/or enforcement than through voluntary adoption among lower-level clients.

RDx Plans: The Regional Exchanges will collect and report needs to R&D policy-makers, and so RDx may have inputs into these efforts, but this is (to quote NIE, 1977), "not within the purvue of the R&D Exchange." It is difficult to tell, however, whether this posture is reacting to the scale or scope often implied in this mode, or to the type of relationship it creates between R&D and client. We would hope it is to the former.

Predictive Factors: Given that this mode is primarily beyond the scope or interest of RDx, the primary issues here relate to the role of RDx in feeding forward the needs of practitioners and linkers to educational R&D policy-makers who are involved in the large, visible R&D

efforts. This narrows down to an analysis of those factors affecting the ability of the Regional Exchanges to collect need information, and of Operations Support, contractors and RDx policy-makers to relay this to broader educational R&D funders, producers and evaluators.

We need to begin our analysis by noting that there already is an existing, though loosely-confederated set of actors and procedures through which major R&D efforts are created, carried out and disseminated. RDx will thus be entering a populated arena, one in which the "antennae" scanning for need statements are already receiving a multitude of (often competing) signals. Further, the existing R&D funding organizations have important constituencies: (1) the R&D community funded by them; and (2) the policy and program community which develops and implements them. Each group has a high stake in the current policy/R&D mix. RDx will have to work, then, in a low key, largely interpersonal mode at first, especially if need-sensing reveals important areas which past and current R&D policy and findings have left untouched. Interpersonal contacts with important R&D policy and educational research groups are important in gaining support, assistance and an active audience, and to avoid RDx being seen as a new and intruding force. There is always the chance of "data shock" in areas where policy has been made in the past in the absence of empirical need and effectiveness data.

There are also certain organizational smoothings needed at the national level, since RDx's role in need-sensing will overlap with the as yet unoperational intent of other portions of NIE to begin an educational need-sensing and monitoring effort. This group and RDx will need to coordinate their approaches toward R&D policy and funding sectors, so as to speak for clients' needs with as concerted and organized a voice as possible. The important organizational factors are, therefore, cohesiveness, openness to other groups, effective participative goal-setting procedures, and coordination ability.

Operations Support and contractors will also have to link to the NIE component. This will require high sensitivity to and knowledge of the R&D policy-making sector, backed up by valid needs data from groups wider than the direct clients of RDx (who are not really typical of, nor perhaps even well linked to, the less-innovative and much larger set of educational practitioners).

There are also strong content and procedural factors at work here, since many of the larger mission-oriented projects and programs are not so much geared to providing deliverables for practitioners as to affecting the conditions and resources with which practitioners work. Thus, the effects may be indirect (and hence in the long term difficult to identify), and the user group for these projects may be indistinct as well. For example, a large action/R&D effort in compensatory education may produce new funds and laws, not new educational materials, and these must then filter down to the practice level. In the meantime the needs data would show little change in the situation.

Need-sensing must also meld with evaluation. Ultimately, a good test of program effectiveness might be reduction in need statements in that area (though there is always the counter-explanation that needs have been changed rather than met). Evaluators, many of whom come from academic/theoretical bases, may be more accustomed to designing their criteria based on professional grounds, rather than on statements of client needs. Some careful work will be needed to overcome large perspective gaps, or to at least educate evaluators in more client-oriented directions.

The general mandate and procedural details for handling needs which do not lead to R&D programs appear unformed in RDx planning, and this may block the processing of such information. On one hand, RDx has neither the capacity nor interest to become the educational equivalent of the Statistical Reporting Service, covering the condition of the educational crop and its problems; but we still cannot assume that R&D is needed to respond to all (or even most) of the crucial needs in educational practice. Powerful policy-makers may even request wider need assessment once RDx demonstrates a capacity to deliver any valid and timely need data at all. Policies need to be developed to define the limits of need information which RDx will collect, and procedures need to be developed to begin forming linkages with those who deliver solutions not based on R&D (e.g., funds, regulations, etc.). In setting the limits on RDx need-sensing, it is crucial to remember that, in asking anyone about their needs, it is illusory to ask only about those things we are interested in providing. It is necessary to provide the context for informational needs, for example, by contrasting them against other need areas.

Finally, the need-sensing capacity of RDx must be questioned. The effort appears to be placing much more attention on delivery than on sensing needs or "feedforward." Solution development and delivery tend to follow Parkinson's law, expanding to fill all available time and capacity; and this is especially true once providers get linked to clients.

Emerging strong and useful client linkages may then tend to eclipse collecting needs data and linking these beyond RDx itself.

Comment: We agree that RDx should not itself operate in this mode directly, in the sense of large-scale R&D efforts. There is something to be said about the value of operating in this style in relation to clients on a smaller scale, however, and RDx should explore this further. The whole need-sensing or "feedforward" function requires as much thought as the solution delivery components; and this function is particularly sensitive, given that the audience consists of R&D funders, high-level policy makers, and the political arena.

Ad Hoc User Research Services (Mode 7)

Description: This mode (shown in Figure 7) is similar to mode one on a minute scale; and is similar to mode three with emphasis on original research on the client's specific need rather than search and retrieval of information from other sources. In this mode, the outside resource person is essentially selling his/her skills as a researcher or evaluator. Relevance and applicability can be assessed if the client collaborates with the resource person on defining the need, choosing instruments and design, etc. Ideally, this mode can provide results in a reasonably short period of time. Labs and Centers are well equipped to provide such services if their staffs include individuals with good linkage and helping skills, in addition to research competence.

[Insert Figure 7 about here]

The two variations, "ad hoc user research," and "user-collaborative R&D" differ in the style of involvement of the client in the process. In the former, the client sponsors the R&D, but may truly become a "client" only when the results begin to come in. Many marketing and organizational studies fit this style. Collaborative R&D keeps the client involved throughout the process as as full a partner as the client's (emerging) skills permit. Action-research is the most collaborative form of this style, with the client involved in all phases, from problem definition through trial change and evaluation. This requires a high degree of openness and effort (see, for example, Lingwood and Morris, 1976).

One example of a variant of this mode is provided by the system in use at the Naval Facility Engineering Command, where researchers rotate in handling questions and may do simple research requests (up to $500) for each requestor. Of course, this is a "hard science" area in which there are actually many important questions which can be "researched" for under $500. The contact person is a researcher, and this makes a crucial difference, both for the quality of skill put into solving the problem, and on for the training researchers get in handling clients' needs.

RDx Plans: "Ad hoc R&D in response to particular practitioner's requests cannot be part of the R&D Exchange" (NIE, 1977). Certain activities of the Regional Exchanges may lead to this, especially as resource persons are linked to practitioners, but the Exchanges will not themselves be active throughout the process.

Predictive Factors: Since we feel there are some aspects of this mode which could be important even though RDx does not see this as a part of its operations, we will explore the predictive factors to a moderate extent. It is also important to understand these factors if RDx is to act as a broker in linking practitioners to this kind of activity.

Direct interaction between clients and researchers provides useful training for both sides: practitioners learn to be more analytical and purposeful, and to base decision-making on emprical knowledge; R&D personnel learn how to be more relevant, and have their concepts, methods and analytical skills tested against the ultimate validity of real-life use. Compatibility between researcher and client on societal, organizational and individual factors makes this possible. Societal forces at the discipline level precondition researchers' entry into this mode; generally, interdisciplinary researchers are more inclined (and perhaps, given the fact that real problems fit no clear disciplinary boundaries, more able) to operate in this mode. Organizational reward systems for the researcher are key elements (again, see Lingwood and Morris, 1976): if researchers are not supported for "applied work," they will not do it -- at least, not after they come up for promotion or tenure. Since the societal and organizational forces move more slowly than the researchers themselves, it is often the case that private R&D organizations (both profit and not-for-profit) will be more amenable to working in this mode. Some such researchers, however, trade off methodological rigor for personal concern with helping people. A more fruitful approach holds that solid conceptualization and method are more important in real settings than in artifically-contrived ones.

This mode requires a high level of interaction between researcher and client, since both will have many unclarities to resolve and much to learn about the other. In the case of RDx, this translates to providing practitioners with resource banks containing researchers in the local area. The REs may be drawn into this mode more than they would like, considering their other duties. Issues of capacity and internal Lab and

Center communications become important here -- the latter in finding others in the organization who could help the particular client if there are no available or relevant outside resources.

Comment: If the Regional Exchanges become active brokers, using the regional resource files to link practitioners with researchers, the RDx effort will have to act to shape the predictive forces discussed above. Beyond keeping files on researchers with good applied track records (not necessarily the same as the theoretical or academic track record, by the way), RDx will need to bolster the reward systems and recognition researchers receive for such work. Recognition for practitioners who become involved is important, too, and these clients will be powerful forces within practitioner networks in diffusing both the outcomes they achieved and the process used to create them. Perhaps RDx could sponsor a series of awards, through both practitioner and research associations, for high quality and useful client-centered R&D as a means of affecting the societal and professional predictive forces. RDx would also have to play a role in entry-level training for practitioners particularly, and to some extent for researchers as well. Practitioners need to operate in new ways in this mode: high error tolerance, ability to engage in honest organizational self-scrutiny, how to understand a researcher and pull him down from the theoretical ceiling when needed, etc.

The Knowledge-Based Problem-Solving Consultation Service (Mode 3)

Description: This mode (see Figure 8) is in current vogue among educators. The emphasis here is on providing very personalized service to specific clients, based on the client's needs and concerns, whatever these may be. This mode then does not limit itself to R&D processes or products. The mode requires the presence of special knowledge or change agents or linkers who can enter into a dialog with clients about needs and potential solutions. The linker needs to have easy and rapid access to outside R&D and non-R&D solution (e.g., educational practice) bases. Pilot experiments with this sort of system (e.g., Sieber, Louis and Metzger, 1974) show this mode to be beneficial and appreciated by clients on one hand, but extremely costly to implement on the other.

[Insert Figure 8 about here]

Clients' needs are the controlling factor here, not what the linker or intervener wishes to provide. Again, R&D information is only one of many bases which may be searched for solutions; and R&D may be used last of all, since greater translation and adaptation is usually needed before R&D can be applied to problem solution, compared with other solutions such increasing capacities, getting political support, etc.

RDx Plans: Regional Exchanges will perform some, but not many, of these functions, with support of the national contractors. Many involved in the planning of RDx have expressed a distinct preference for this mode, even with the high costs involved per client contact.

Predictive Factors: Three factors appear to limit the ability of REs to operate in this most client-centered mode: (1) the limited level of support for full client-orientation, such as moving outside of the R&D or even informational realm (note that these activities are "optional" for the REs); (2) the skill and capacity base of the REs themselves; and (3) the need-filtering system which may operate between REs and clients.

First, RDx support for such work is likely to depend on the extent to which the "solutions" derived relate to or come from educational R&D. Again, we need to note that this mode assumes that R&D may have limited relevance at best to many client need statements, and that in any case, linkages are not well-formed by forcing the client's interests into any one mold. RDx's level of support might be higher were the system to view this mode as an important intelligence-gathering activity -- to find out where clients really are and the broad scope their needs may take; with the added plus of some products which may be useful elsewhere.

REs may decide to opt out of this optional activity, especially if they are spread thin and kept busy with more central RDx activities. One of the crucial facts of this mode is the labor-intensive character of work with clients. RE leadership also will have to exert guidance over those from their staffs who do become involved in this mode, since there is a tendency for "action people" not to record their approaches, skills and learnings for others to use. They tend not to write because publication would make their successful approaches public, and hence not exclusively theirs in the competitive action market; or because they are simply so concerned with helping the next client that they cannot find the time to reflect and write.

Finally, the fact that RDx's prime clients are not practitioners, but rather linkers who serve practitioners, may set up some blocks or filters between RDx and true expression of practitioners' needs. The "linker clients" are most often persons whose interests and job descriptions relate to dissemination and use of R&D. They may not be in a position or have the interest to collect needs which do not relate to R&D solutions. RE activity in this mode, or in setting up this mode through outside resources, may overcome any bias in this area.

Comment: The optional character of this mode of operation, and the strong possibility that it will move well outside the realm of R&D, make the successful use of this approach very problematical in RDx. We feel that RDx needs to be aware of what these kinds of projects are learning and saying, however. The support and start-up role of the REs is even more important here than in the previous mode, however, exactly because this mode is more "action" than "research." Again, the costs are very high per client reached in this mode, and this suggests that RDx link to these activities indirectly, hopefully without having to cover many of the costs involved.

SUMMARY OF THE OPERATIONAL MODES

These eight modes represent tremendous variety at all stages in sensing needs, development of linkages, delivery and implementation. A graphic summary of this variety is shown in Figure 9. Again, the modes are listed in order according to extent need-sensing and client-orientation. It is instructive to compare that happens in the other columns, particularly on the producer side, as attention to clients' needs increases from very low, through normative, to individualistic.

[Insert Figure 9 about here]

Perhaps the most important are the planning and centralization columns. These start out very low, since the KPU "effort" itself is usually peripheral or tangential to knowledge production in the first two modes. Planning and centralization reach their peak somewhere in the middle, when large-scale efforts are planned to reach dissemination objectives; need-sensing is in the individualistic mode here, but the clients are still in a position of low control over what they get from the effort. When clients exert control over both form and substance provided by the effort, planning and centralization are reduced; or, it may be that lower planning and centralization signal an openness which permits clients to exert more influence throughout the linkage process. Cost is not shown in Figure 9, but it generally increases per client linkage as we move from top to bottom in the figure; however, the clients become more active in covering their own costs in the bottom modes.

Can this ordering of modes be considered as a developmental sequence? There is no simple answer. We believe there is a general tendency to become increasingly open to clients' needs and participation if there is a central mandate that the effort have an effect on the client, but if the clients resist the effort. In some cases, after years of unfruitful attempts to get "users" to actually make use of R&D, the KPU staff say, in effect, "OK, we give up, what is it you people really want?" We note that even in education the push for need-sensing grew more than a decade after establishment of major dissemination activities such as ERIC.

Figure 9 masks a relevant and important consideration, however: as we move toward the bottom of the figure, where the participation of each client is greater, there are actually fewer client organizations who ever enter that mode in the first place. A winnowing out takes place between the delivery-oriented and the client-oriented modes, with only the most open and innovative clients moving into modes seven and three. Thus, seen from the producer's side, this sequencing of modes usually is not a developmental sequence, since so many of the potential clients would drop out along the way. From the perspective of the innovative client, however, there probably is a developmental sequence, as the organization becomes sensitized to the existance and then the limits of R&D-related resources, and finally brings the empirical approach in-house so as to get more out of it.

SUMMARY OF RDx LINKAGE ACTIVITIES

In our presentation of the operational modes we identified many of the linkage activities of RDx. It is useful to pull all of these plans together, however. Figure 10 lists those activities mentioned in the NIE solicitation (NIE, 1977) by which REx will make contact with its linker clients. We have divided these into four levels: national and regional exchange level, and in each, R&D- and client-oriented. This coding is based on our judgment, of course, and is open to discussion -- preferably discussions between RDx planners and prospective clients.

[Insert Figure 10 about here]

There are three kinds of flows relating RDx to its clients, illustrated by the directionality of the arrows in the Figure. Some flows are deliveries of information, skills, help, etc. from RDx to clients; other arrows capture flows from clients to RDx, with needs and requests for help being the most important; finally, there are bi-directional arrows which indicate partnerships or mutual influences (perhaps true interpersonal linkages).

First, we note that almost all of the connections exist at the Regional Exchange level. This illustrates the "front line with support troops" model built into RDx. The REs serve to buffer between the clients and the R&D- and client-oriented functions of the effort at the national level (e.g., contractors), so there are many information flows between the REs and the support functions which we have not shown in the Figure. This brings up the issue of potential overload, however. We say the same thing in the early 1970s when (then) OE was developing the design for the educational extension agent concept. There was general recognition that the real power of the effort was in the direct contacts to be developed between the agents and practitioners, and thus, all important functions of the effort as a whole were channeled through these people: need-sensing, training, solution delivery, performance monitoring, etc. There are severe dangers of overload in this style of operation which may confront the REs, as well. Almost all of the national-level functions channel through the REs, and while this is probably good from the clients' perspective (having only one source to deal with), the REs may have so many things to do that direct services suffer.

The second thing we notice in the Figure, echoing what we saw in the discussion of the modes above, is that there are many more delivery arrows than need and request arrows, even though we cannot simply count the number of either. The many different delivery arrows represent alternative ways of reaching clients in some cases; and given the number of these, we hope they would be applied selectively in order to best match needs, content and media preferences, etc. The principle of redundancy is another reason there are so many delivery channels, too: any one means may miss the target. This brings up the question, however, of why there is no redundancy built into the need-sensing and help-requesting channels? Since so many of the need-sensing activities channel through the REs, there is special danger of them being lost or buried if the REs become overloaded or busy with delivery and/or the need-sensing activities are seen as optional in any way. The REs also need the ability to serve as redirectors for needs which are outside the scope of R&D; this implies that REs will need to know the most likely sources of information and help in many other areas of education. The REs will have to fight the tendency to interpret every need or request in terms of R&D. The "law of the instrument" applies to service efforts especially: it is very easy to see the thing you do best as the solution to every ill.

Client participation in RDx planning and management is another issue, since there are no clear flows leading into this process. Clients need to have an influence in order to keep the effort balanced and to feel they have some real stake in its success. Participation is also the key in helping clients see the overall operations of RDx, since many of the activities are, by themselves, only parts of linkages, and the total pattern of linkage is visible only at the large scale. Clients need to see that the needs collected from them have been channeled into national RDx activities such as priority area definitions, influences on R&D and policy, etc., and that solutions will be forthcoming in the future. This awareness will highlight the need to be concerned with future needs, so that solutions will be ready when the needs become real (e.g., implications of scarcities of energy for school integration).

Before any needs assessment or participation can be planned, however, any KPU effort needs to have a firm definition of who its clients are. Client definition is crucial in RDx, particularly as it affects the relation of RDx to the ultimate client, the educational practitioner. Capacity problems limit RDx's ability to move much beyond the "linker" client, yet we have mentioned several issues in which the linkers' perception of needs and their delivery capacities are crucial. There is the danger of the following vicious circle: (1) linkers may see their role as helping on problems on which R&D has something to say; (2) RDx determines needs of these linkers in terms of needs for new R&D; (3) new R&D is made available on these topics; and (4) the information is delivered to linkers, thus narrowing the range of topics on which they have the most recent information. To break this circle linkers will need to be exposed to a wide range of practitioner problems; thus they will have to be well integrated into the total range of services and perspectives within their own agencies. This will also help them filter off needs which other components of their organization can deal with more efficiently.

There is also a great need for validation data on the needs for and impact of RDx. At one level there is a need to check on needs as identified by REs, linkers, need-sensing surveys, and the practitioners themselves. All need-sensing should begin by asking about problems, not just needs for information, since this is the only way to keep the importance of information-solutions in perspective.

Illustrating this latter point is an issue which is somewhat beyond the control of RDx, but which will affect the effort nevertheless. This is the notion of R&D as the purveyor of "more" rather than "less" (Caplan, in press). R&D information concentrates on the new: curriculum, service programs, teaching concepts, facilities, etc. Yet, American education is in a period in which it must struggle simply to keep the old. A one week scan of our local newspaper revealed three school districts which were imposing budget cuts as the result of millage vote failures, or which were attempting to restore past cuts through second, third, or even fourth millage elections. The cuts covered the usual frightening range: teaching positions, vocational education, pre-school math and reading, library clerks, programs for the gifted, athletics, transportation, computer-assisted instruction, electives, etc. In other areas taxpayer "revolts" have closed schools completely during parts of the year or have forced returns to the basic three Rs. The key question is: how can R&D in education, and hence RDx, be helpful to educators who are facing these crises? How can educators think about "self-actualization" when they are struggling with "survival"? RDx cannot deal with these problems directly, or lose sight of its original objectives; but it cannot ignore these pressures at the practitioner level; and if need-sensing efforts do not uncover the precedence of issues such as these, then we would suspect that the need-sensing is not probing beyond the sometimes trivial questions of "what information do you need?"

These issues are not the only ones we have uncovered in our analysis, but they are central ones from the linkage perspective. There are also some important comments to be made from the vantage point of the predictive model, and we will cover these next.

SUMMARY OF RDx AS SEEN FROM THE PREDICTIVE MODEL

Here we will look at the crucial background issues affecting RDx at each of the predictive levels in our model. We will have to violate the model by talking about each of these separately, however. We will begin at the broadest level and then work to the specific, as does the model.

The Societal Level

KPU exists between competing societal factors: the push to achieve more bang for the R&D buck on one hand, and pressure of a tight economy and conservatism on the other. The present situation into which RDx will enter may be the result of time cycles in R&D: the current proliferation of R&D products is the result of many studies begun in the more flush times of the late 1960s. On the other hand, educators are suffering the consequences of the most recent recession, the declining birth rate, and taxpayer unrest based on continuing inflation. The time cycles are different with each of these issues, yet they reinforce each other, something like societal-level biorhythms, making the task of RDx more difficult in the compounding.

The change vs. economize issue may mean that RDx will have to work hard to demonstrate the practical, cost/benefit relevance of R&D; and this issue also underlies our concern that RDx not limit itself only to R&D products. Practice innovations dealing with how to cut costs, get millages approved, etc. may be much more important to many clients, and can serve as useful topics for delivery, opening up the linkage with that client for later messages based on R&D.

The Organizational Level

Leadership commitment to KPU activities is crucial to their success, at both the producer and consumer end: leadership encouragement of applications-relevant R&D on one hand, and leadership concern with being innovative on the consumer side. There is no one R&D organization which will be involved with RDx, of course, since educational R&D is spread through the academic, public, and private sectors. About all

RDx can do is to work actively for recognition of useful R&D products and the individuals who produce them. The reward system issues we mentioned earlier are thus important for work by RDx: special awards, publicity for contributions, incentives to academic leadership, etc.

On the practitioner side the issue is even more important, but is more difficult to resolve. One approach is simply to work with the most innovative practitioner organizations, and then to use these as demonstration sites for others -- fighting the "not invented here" syndrome as you go. Good cost/benefit data will be needed as part of any demonstration effort. It may be, however, that it is the organizational precondition which leads to use of RDx products, not any appeal or persuasiveness inherent in the delivered product itself. If this is the case, then the strategy for RDx is not so much to concentrate on proving the product, but in finding those organizations which are ready for change, and in trying to make modest changes in this readiness.

The Individual Level

Given conducive organizational climates and conditions among producer, disseminator, and consumer organizations, RDx must then form active linkages with the best and most promising people. It is sometimes difficult to find the right person initially from outside that person's organization. On the practitioner side, the past experiences of the REs will be helpful in identifying such persons. But these experiences are likely to be tied into that person's effectiveness as a consumer, not as a need-senser. It may be more difficult to find persons who have accurate assessments of needs. Much early attention of RDx may have to be placed on training and developing a group of field contacts as good need-sensers.

The linker client is the narrow point of contact between a large set of practitioner organizations on one hand and a large set of resources (which RDx will tap) on the other. RDx must thus monitor the capacities and burden on these filters/gatekeepers. Overload will be a problem for the linker clients.

Individual skills on the RDx side are also important, as we have seen: openness to client input, linkage process skills, knowledge of resources in education, attitudes and values favorable to service roles with clients, etc. Top leadership in RDx should also check their behaviors against those characteristics of effective leaders identified in Part 1.

The Procedural Level

A great deal of freedom has been left to the individual REs in how they link with linker clients and others, and this is healthy. We feel the REs should work to maintain the dialog character of linkages at the individual level and at impersonal levels, too. There are no clear answers, however, to the problem of how to build into phased impersonal activities the participative, self-correcting, and reciprocal characteristics of interpersonal linkage.

Procedures need to be developed for linkages in the following areas: (1) for need-sensing at all levels; (2) between RDx and top-level policy making clients; and (3) with the R&D producing community. The NIE solicitation indicates that each of these linkages will be formed, but we have seen little elaboration of how.

The Content Level

We have said many times that the quality and perceived utility of existing R&D-based information may be a barrier, even given efforts to screen for quality, package priority areas, etc. This is more of a problem at the national than at the RE/regional level, since the latter will contain more practitioner-initiated information, and since the closer source is likely to be perceived as more relevant in any case.

Relationships Among Predictive Factors

The predictive model asks us to evaluate background forces from the standpoint of how they interrelate to produce effects. At this point the best guidance we can provide is a set of questions which need to be asked about each predictor:

(1) does it affect the whole RDx effort equally?

(2) if not, does it apply to only one or a few of the linked elements in RDx; or does it work in different ways for the different groups or people involved?

(3) if not, is this a dimension on which linkage partners should be as alike as possible?

(4) if not, does this predictor require different-yet-compatible conditions, actions, or opinions; or, are there different predictors which must be compatible?

(5) if not, is this a content or linkage-procedure factor?

(6) if not, then we probably don't know enough about this predictor and need to discuss and research it.

OUR FIT WITH THE OTHER RDx AUTHORS

Most of the important areas of agreement or disagreement with the other RDx authors fit within the predictive model headings, with additions dealing with issues such as need-sensing. We will cover the more important areas below.

There is not too much to be said at the societal level, perhaps since all of the papers, including this one, are suspicious about making sweeping comments on the grand scale. Mojkowski's (1977) points relating to the configurational approach, which interrelate factors somewhere above the interorganizational, parallel our feelings nicely.

Most of the action starts at the organizational and interorganizational level. Beginning at the start with the issue of planning, we are in agreement with those authors (e.g., Gross, 1977; Mojkowski, 1977; Zaltman and Sikorski, 1977) who recommend more careful or better planning activities. We would emphasize, however, the necessity for participative planning, involving clients from the beginning. Since the beginning is past, we echo Mojkowski's concern with what RDx must do to overcome barriers which have grown as a result of RDx's too-centralized and too-exclusive planning approach in the past.

Mojkowski ties perceived benefit into the process of clarifying goals. We have mentioned the benefit issue several times, and it is linked to need structures, perceptions of the worth of R&D, and so on.

Gross' (1977) comments on perceived threat among organizations with whom RDx might compete is well taken; but we would note that RDx cannot be blamed for excessive levels of organizational paranoia it may encounter elsewhere. Still, this again ties into the need for participative planning, and given the past of the effort, there may be a need for some fence mending with other important groups. Overload is also an issue mentioned by many authors both at the inter- and intra- organizational level. We have covered this issue from several perspectives, and are in agreement with what the others have said.

Gross' comments on leadership skills again remind us of modern organizational theory, and there are close affinities between our view and those of the other authors who have a base in this field (e.g., Zaltman and Sikorski). This bridges over into the individual level, of course, but we made fewer marginal notes relating to this in reading the other papers. Perhaps we are feeling some difficulty here since it is difficult to make too many comments at the individual level without personal knowledge or research data on all of the individuals involved in the RDx effort.

At the procedural level, we resonate to the stress on multiple channels mentioned by Mojkowski. His term "collaborative affiliation" is a central concept in our conception of the linkage process. The educational marketing study (ERIC/TE, 1977) also is useful as background information here, highlighting the importance of interpersonal, often intra-organizational information sources.

Zaltman and Sikorski parallel the points we made in Part 1 concerning content, dealing with characteristics of innovations. In looking at innovation content, however, both we and Mojkowski caution that communication is not the main reason for non-use, while lack of perceived value of R&D and inability to implement are. The issue of hard vs. soft innovations also comes up, especially in the Bean and Rogers (1977) paper, and the need to fit the conceptual approach to the field (which was central to our discussion in Part 1) is illustrated in their cautions about the fit of the agricultural extension model in education. Time lags and momentum for change also tie into the hard-soft dimension, with education being in a position where softer innovations take longer and thus are in more danger of losing momentum.

Need-sensing and feed-forward functions (or their lack) are hit hard by many authors, though we are perhaps most insistent in this area, based in our concern for balance and client-participation. Bean and Rogers highlight the importance of _early_ need-sensing, or rather, input and control of farmers in the early stages of the agricultural extension system. This fits closely with the problem-solving and linkage approaches. They note that RDx looks "top heavy" -- another way to say this is that RDx is "bottom-light." Their phases start in the field, as would a need-based approach, and we feel they are correct in setting up phases in which institutionalization _follows_ linkage building and a consolidated support base. Rich and Goldhar (1977) also propose bringing users in early in specifying the value of information, goals, and priorities. We would agree if their definition of valuation also includes _comparisons_ of the value of R&D information, other kinds of information, and non-information solutions to problems. This is one expansion we would add to their first step of asking practitioners about information requested -- we would start by asking about problems and successes, then filter down to types of solutions for problems, the role of information as one kind of solution, and finally the importance of R&D as one kind of information. This approach provides what we feel is a needed context around R&D solutions.

Kotler, _et al_.'s views of need-driven marketing as _exchange_ seems to miss an important point: what about the _other_ side of exchange, i.e., what happens to producers and R&D itself as a result of exchange with practitioners? There seems to be no place in their model for allowing practitioners access to R&D policy and goal-setting. Tieing evaluative feedback into product re-design is not the same as giving clients the ability to have a real influence on the broader issues of what policy should be, what R&D should do, and indeed, what the very interaction process should be by which they make their inputs. We feel the marketing approach needs an infusion of organizational concepts to be really fruitful, also.

We could go on with this synthesis, but we feel we have covered the major areas. From our perspective, however, there seems to be an author or two missing in the set of papers: there is nothing here written by a practitioner, be he/she linker, teacher, administrator, or whatever. Again, the very process RDx and all of us who have written these papers have taken is very "top-down." While many of us have tried to add the missing component, and serve as stand-ins for the practitioner perspective (since our collective experiences appear to point very strongly in KPU as a dialog among equal partners), we ultimately cannot go very far with the process. In the final analysis, there are two kinds of linkages in RDx (or any KPU effort): those in or as a result of the effort, and those about the effort. If we stress reciprocal dialog and exchange in the former, then it seems logical that we should do the same in the latter.

RECOMMENDATIONS

We have used several different perspectives in this paper, analyzing RDx from the standpoint of operational modes, predictors of linkage, and a general concern for balance in both the effort as a whole and in the specific linkages which will take place within it. We have seen that RDx may be too complicated to be summarized in any one theoretical approach or operational mode; nevertheless, we have argued that the "linkage predictive" model can be used to summarize and integrate most of the areas important in the design and functioning of RDx.

Our discussion has produced several recurrent themes, most of which are echoed by the other RDx authors, which we will now cast in terms of recommendations for the effort. We need to caution that these recommendations are not really the final word -- they just come at the end. We feel it is necessary to read at least the sections which follow our presentation of the operational modes to get the flavor and fervor of our concerns. Much of the analysis and many of our recommendations here may be seen as stressing balance in linkages, reciprocity in effects (i.e., both on R&D and policy, and on practice), and openness and participation as a management and operational style for RDx.

Below we will propose three broad sets of recommendations derived from the analyses above. The first set pertains to the operating philosophy and image of RDx. The second relates to the operational modes which might be emphasized. The third relates to the process of system monitoring and redesign.

A. Operating Philosophy and Image.

> A.1 We believe that RDx should strive for consensus among its members and relevant stakeholders concerning its operational philosophy and image. We believe that that philosophy should place most emphasis on linkage, resource brokering and problem-solving assistance, rather than on research and development products per se. Component elements of that operating philosophy might include: (a) client need orientation, (b) responsiveness to clients, (c) two-way dialog concerning needs, solutions, and reactions to solutions, (d) the brokerage role (connecting clients to a universe of resource persons, products and services), (e) providing a range of alternatives which leave the client with meaningful choice and a sense of control over the decision-making process, (f) follow-up capacity to indicate to clients that RDx is concerned not only with dissemination but with

the full cycle of problem-solving and educational renewal, (g) capacity building so that clients can ultimately take unto themselves the resource linking and problem-solving functions that RDx initially provides.

A.2 RDx should work to build the strongest possible links to other linkers, brokers and consulting services in the "natural network" to demonstrate its non-exclusive and complementary functions, as well as to enormously expand its resource linking capacity.

A.3 RDx should strive in many ways to cultivate and broadcast an image of client-centered resource linking, as suggested in recommendation A.1. Image building activities should serve to allay fears of other stakeholders, and to develop a client constituency which is aware of and interested in the types of services which can be provided.

B. What Operational Modes are Most Appropriate for RDx?

We recommend that RDx planners and decision-makers review the descriptions of the eight operational modes we have presented, to determine which apply most strongly to the type of effort they are trying to develop. In making this determination they should consider the fact that it is not possible to operate well in all modes simultaneously, given present and projected resource constraints of RDx. Furthermore, an attempt to invest in too many operational modes simultaneously may confuse the image and the operating philosophy, both to your clients and to your members. Thirdly, the adoption of somewhat contradictory modes, for example "Knowledge-Based Problem-Solving Consultation," and "R&D Product Dissemination," may create role conflicts for persons and organizations within the RDx effort. Fourthly, members of RDx who are Labs and Centers have a history, capacity, and image connected with some of these modes, e.g., R&D product dissemination, but not with others; hence, if they extend too broadly they may not be building on existing strengths, and may be acting counter to the expectations of important clients and stakeholders.

We would further make a few suggestions concerning the specific relevance of each of the eight modes as follows:

B.1 Nurturing the Natural Network: It is clearly beyond the capacity of RDx to follow this mode completely, in fact, RDx represents only a part of a federally-funded effort to nurture dissemination capacities in existing institutions and to fill gaps between them. Another problem in pursuing this strategy is the likelihood that results will have low visibility and exhibit little short-term evidence of payoff. RDx needs such evidence to survive through its formative period. RDx should not assume that there are effective linkages among the many different natural networks which exist, however. Indeed, the creation of these should be the prime goal of RDx in this mode.

B.2 Continuous Flow Dissemination: RDx will require some activities in this mode to build a constituency and to build an awareness of and interest in its general objectives, and its values to that constituency. However, it seems unlikely that this will be a prime mode for RDx.

B.3 R&D Product Dissemination: It should be noted that planned proactive dissemination is necessary to get the widest and fullest utilization of educational R&D. It should also be noted that R&D Centers and Regional Laboratories have traditionally and some times very effectively engaged in marketing their own products. We therefore recommend that RDx give further consideratiion to the place of and need for this mode within a total system configuration. In particular, they should consider how new RDx initiatives in other modes will relate to or conflict with past and ongoing Lab and Center activities which are clearly in this mode. For example, one might ask how "alternatives" can be posed fairly and effectively by an agent who has devoted one third or more of his or her professional life to the development of only one of those alternatives.

B.4 Instant Response R&D: The major concern here is duplication of existing effort. There has been more progress in the last decade in this area than in any other in information services, and several nonmembers of RDx are proven and expert providers (e.g., SMERC, RISE, New Haven ERC, etc.).

B.5 Rapid Response Reporting: RDx needs to experiment with this promising strategy, but to be fully aware of its cost implications and the necessity of being extremely selective and strategic in the questions and clients it wishes to cover in this way. After a "free" start-up period during which the service presumably proves its value, a gradually escalating fee-for-service schedule might be implemented. Rapid reports should also feed into continuous flow channels as a secondary market, to multiply the number of users who might benefit and to improve the benefit/cost ratio.

B.6 Coordinated, Mission-Oriented R&D: This mode is clearly outside the cost feasibility realm of RDx as currently conceived; however, through the feedforward function RDx should play a key role in a larger problem-solving loop which involves NIE, universities, private organizations, states and labs and centers. Feedforward should serve to articulate real and pressing client needs and concerns, and should activate the organizations responsible for knowledge building activities. The fact that RDx does this (with credible examples) should be broadcast to its constituencies so that they can understand and appreciate the purpose and value of the feedforward function.

B.7 Ad Hoc User Research Services: Many people and organizations in the "natural networks" have the capability of performing such services, and many routinely do so already. Therefore, we would urge RDx not to compete in this area, but rather, to serve as a broker, especially to connect clients to unusual or remote helpers.

B.8 Knowledge-Based Problem-Solving Consultation: Although it is clear from much of the early discussion among RDx members that this is the preferred mode, RDx should be cautioned to consider the very high costs of providing satisfactory and rewarding services of this nature. RDx must be very selective, and perform very well, so that it may serve as a model for future educational cooperative extension and problem-solving programs funded by federal and state initiative. Again, RDx should operate as a broker for outside resources who can operate in this mode.

C. Monitoring and Continuous Redesign of the RDx Effort

The KPU linkage-predictive model proposed here represents a reasonably comprehensive and systematic approach to defining and modeling the functions and predictors of an effort such as RDx. We propose that some such model be adopted or adapted by RDx to understand, monitor, and evaluate itself. We further propose that such modeling efforts and data collections be used in guiding the continual redesign and self-improvement of the effort and its many elements. This means beginning with a conceptual approach which is shared by RDx and its clients, then basing evaluation and change on that shared understanding.

APPENDIX A

A STRUCTURAL EQUATIONS APPROACH TO THE KPU LINKAGE-PREDICTIVE MODEL

It is insufficient simply to say that some broad classes of predictors relate to KPU criteria. Predictive models cannot deal with this level of uncertainty -- some structure, restrictions and assumptions must be made. The issue is that of getting a model specified to the point at which it may be analyzed. In this section we will begin this process for the "new" KPU linkage-predictive model we introduced in the body of this paper. In beginning, we will be concerned with developing the model to the point at which it: (1) allows for multiple "criteria" of linkage, dissemination, and utilization; (2) includes time as a dimension to attempt to get at the dynamic character of linkages; and (3) handles the various types of predictors and predictor interrelations mentioned in the text. We need to elaborate each of these points before discussing the model itself.

Criteria: One danger to be avoided in model building, particularly in the area of KPU, is that of choosing "criteria of convenience": those things we can measure most easily, regardless of their importance. For example, it is easiest to measure dissemination or transmission activities such as whether some knowledge or innovation is or is not delivered, or whether specific clients' needs have come to the attention of others. It is much more difficult to determine actual use or impact of either innovations or needs, since (a) effects take time to occur; (b) they are likely to be diffuse and integrated into the ongoing operation of organizations; and (c) the causal effects of innovation or need messages are difficult to extract from effects which occur for other reasons. In this model, then, we need to insure that criteria are not chosen because of their methodological simplicity rather than because of their theoretical or practical importance.

The ultimate criteria for linkage are hinted at in the definition we provided in the body of the paper; potential need reduction through delivered innovation, knowledge, or need statements, and mutual understanding between the linkage participants. "Potential" is an important term here: we must be able to separate what takes place in a linkage from the context-affected outcomes of that linkage. Thus, the interchange of needs and solutions which takes place in a linkage may be seen as a necessary condition for change in either the client or the solution-provider, but the interchange is not identical with this change. Linkage is, at its most elemental level, simply a type of interpersonal or intergroup communication process, with communication defined also very elementally as the sharing of meaning. Effects of linkage begin to take place among the linkage partners while the communication and sharing is going on. The ultimate effects may occur a long time after, once the participants return to their organizations, and plan and carry out activities which affect behaviors of others into the future.

Linkage effects may be informational, attitudinal or behavioral, though we tend to support the view that the only effects which ultimately matter are the behavioral changes -- what actually happens to and as a result of human behavior in the realm of (in this case) improved educational practice. Practice implies behavior. Thus, the interests of the model should parallel those of the policy-maker and the practitioner; extending outward to the final changes in practice produced by linkages. This does not imply, however, that the intermediate criteria are unimportant.

There is a more immediate criterion to be included, however, and that is the formation of linkages themselves. The model must be able to handle both those factors which lead to or control the probability that linkages will occur, and (once formed) the chain of effects of the linkage.

Time: The chain described above, in which linkages form, endure, and eventually have effects implies that the model must be able to deal effectively with the time dimension. That, is, the model must be dynamic. Figure A-1 shows the simplified time order in which linkages form (T1), endure (T2), are carried back to the parent organizations (T3), and have effects (T4).

[Insert Figure A-1 about here]

At T1 we may think of those factors affecting the compatibility of the two systems or organizations as the shorthand term for the general factor which determines whether a linkage is likely to form. Perceived benefit is another important component. Given some minimal level of compatibility and perceived benefit, the systems send components (usually persons) to be involved in the linkage lasting throughout T2. Here those factors predicting the participants' linkage abilities become important, as do the procedural and content factors within the linkage itself. At T3 the participants return to their respective systems, attempting to transform and re-transmit what has been learned in the linkage, or to affect some change in what that system does or how (at T4). Here organizational predictive factors become important, in addition to the system-manipulation skills of the former participants.

The dynamic character of individuals and organizations becomes important, since it is clear that the situation is not static while the linkage is taking place. Organizations may not be at the same "place" at T3 as they were at T1, perhaps stranding the linkage participants. The linkage participants may themselves be changed so greatly that they lose their abilities to function within their organizations (e.g., cooptation of practitioners, or resource persons "going native").

Predictor Levels: The predictor levels follow roughly from the discussion above, and these have been discussed in some detail in the body of our paper. Here we will only elaborate on the methodology used to develop the predictors.

We combined several sources in this process. We began with the classes of factors which promote linkage or utilization, such as those from Havelock (1969), Havelock and Lingwood (1973), etc., and the conceptual scheme of Guba and Clark (1974). We checked these by coding factors found to promote or inhibit dissemination and utilization, as presented in the abstracts contained in the 1971 NIMH review of principles of research utilization.

The Statistical Model

The statistical level of our approach runs far ahead of the current conceptual level of our model. This is unavoidable, as the approach used here is the best one available to handle the problems of multiple criteria, time orders, and complex interrelations of predictors. We will consider linkages, not individuals or groups, to be the units of analysis in our model. We will also have to make some rather grandiose simplifying assumptions about definitions, measurements, scalar properties, and indeed, about the very measurability of the key concepts. We feel it is better to think big and to make these assumptions while ignoring many of the limitations on the model; the alternative is to neglect the task of beginning to formulate a more comprehensive model of KPU.

The statistical model we will adopt here is that of linear structural equations. These equations may be seen roughly as a much more powerful form of path analysis. The technique allows: (1) multiple observed indicators which are accounted for by underlying "true" concepts; (2) reciprocal predictive linkages between criterion (endogenous) concepts; and (3) correlated error terms if desired. The method is covered by Goldberger (1972), Goldberger and Duncan, (1973), and Joreskog and van Thillo (1972). We will not discuss the method in any detail here, since at this formative level we will be using the logic of structural equations almost at a symbolic or anological level. The approach makes us pay attention to details and interrelationships even without a detailed knowledge of the method; and that is what is important at this stage.

The basic model with which we start is given in Figure A-2. Here we see source and receiver systems or organizations (referred to in capital letters), and individuals (in lower case) who emerge from these organizations at Time 1 to enter into a linkage enduring through Time 2. Effects of the linkage occur in both organizations, as a result of the acts of the participants during Time 3, resulting in some utilization acts or changes in the organizations at Time 4. These circles do not represent the organizations or persons in the descriptive sense normally used in KPU descriptive modelling; rather, each circle is a criterion concept measured by one or more observed indicators. At Time 1 the organizational and individual circles stand for the broad concept of linkage-readiness, and afterward they may be seen roughly as linkage impact. The exact definitions depend on what measures are used to represent each concept, much as one would label a factor in a factor analysis according to loadings on the observed measures. Note that there are two predictive arrows between the organizations and individuals in each time period. These account for behaviors and attitudes which are formed in reaction to (or by perception of) the "other."

[Insert Figure A-2 about here]

There are five ways or "classes" in which predictors operate in this model. Not shown in the Figure is the fact that each class may be made up of several separate but interrelated predictor concepts, and that each of these is a construct measured by one or more observed variables. Further, these predictors (exogenous concepts) may change from Time one to Time 3, so there will be two sets of measurements for each construct.

The five classes or styles of predictor operations are:

A. Forces which affect both source and receiver organizations or individuals in an equal manner -- e.g., social climate for change, laws and regulations, etc. These may be different at the organizational and individual level, so we have both upper and lower case versions ("A" and "a" predictors).

B. Forces which affect either source or receiver organizations or individuals. Some elements, e.g., organizational size, would be included as separate predictors applied to their appropriate organization.

C. These predictors are "homophily measures; instances where the absolute level of the predictor is not important, but similarity between the two organizations or partners is. Appearance, background, etc. on the individual level would fit here, as might organizational type and so on. Measures at this level would take the form of difference scores or ratios between S and R, or between s and r.

D. These predictors are interactions or pattern variables in the limitations imposed by the linear model used here. Examples might be S's desire to provide help coupled with R's desire to receive it; or s's transmission skills coupled with r's listening skills, etc.

E. These are elements which affect the linkage situation itself; primarily the procedural and content factors elaborated in the body of the paper. One must be careful here, however, to distinguish between those factors which predict the situation from those which stand for the criterion of linkage itself; the latter would probably be measures of amount of information (needs and solutions) transferred.

We will not explore here the relation between these predictor "operating styles" and the levels of predictors discussed in the paper. It is obviously possible to enter styles and levels as margins of a matrix, and to enter predictors according to where they fit according to what we know about KPU processes. We would probably find that more abstract levels (e.g., the societal) have predictors which tend to operate in style A, and that as the levels become more specific and individual, the operating style moves down toward homophily and compatibility. This is only a guess, however, and we leave this exploration for a later time.

Ignoring the fact that there are likely to be several concepts in each class, we can express the model in terms of a set of equations, one for each criterion concept, as in Figure A-3. The matrix of "Betas", with each row representing one criterion, shows that there are hypothesized relations among the criteria, relations whose sign and strength the empirical analyses would determine. The matrix of "Gammas" shows how each of the predictor concepts (the columns) is hypothesized to relate

[Insert Figure A-3 about here]

to each criterion (row). The four time periods are also included in both matrices. In addition, "time zero" is included to handle the effects of past utilization experiences on each system and person, e.g., the momentum generated by past success, or the resistance from past failure.

Let's look at the model elements before the linkage takes place, at Time 1 (the first four rows in both matrices). The first four criteria here are configured to mean linkage-readiness, and could be measured by attitudinal or projective behavior measures at the four levels (S,R,s,r), or by commitment of effort to impending linkage. Need is a major component in R's readiness, and having solution materials available is central to readiness in S. The Beta elements indicate that each organization's and person's readiness is conditioned by perceptions of the other organization or person -- bringing in the key interpersonal perception elements of the linkage concept -- and each person's readiness is predicted by the readiness of his or her organization. The matrix of predictor paramenters on the right (Gammas) shows that past utilization in both organizations predicts readiness in both, as do the predictor concept sets A through D. similar predictive relations exist for the individuals. Note that coefficients for A, B, and C (and a, b, and c) elements are constrained to be equal within each set (i.e., the subscripts are identical). Type B predictors are different for S and R, and s and r, since these forces are hypothesized to operate differently in each organization or on each person.

The extent or intensity of linkage is predicted by all four readiness criteria (row 5), plus the external linkage predictors (E) as discussed above. The Time 2 period is variable, of course, ranging from a single elcounter to a protracted interaction, and duration itself is one of the proedictor concepts in set E. The methodological issue here is how to divide up the time periods for analysis uprposes; but we won't even attempt to solve this thorny issue here.

At Time 3 we encounter the first effects of the linkage, on both participants and their organizations (rows 6-9). Effects could be measured by dissemination measures, and again, by personal and group reactions. The Beta predictor pattern is similar to that of Time 1, but with one addition: readiness at Time 1 predicts effects at Time 3 for both organizations and both participants. Also, the predictor concept matrix of gammas is equivalent to that at Time 1, with the same coefficient-equivalence constraints imposed.

Finally, there is utilization in both organizations: for R this would be change in the form of implementation of "solutions" brought through the linkage; for S utilization would be integration of R's needs into planning, programs, or products. In the next cycle of analysis, of course, these utilization constructs would become the first two external predictors in the matrix of Gammas.

Summary

We have blithely ignored the complexity of structural equations models, exact definition of indicators of each construct (which are not even shown in Figures A-2 and A-3), and problems of measurement, to say nothing of the feasibility of collecting enough data to be able to do an analysis. We do not intend that this model be tested in its present form. For example, each of the criteria and predictors in the model is likely to be expanded into several concepts in application.

Our purpose here was not to work out such details, even the major ones, but rather, to show one way in which many elements, interacting in complex ways over time, could be presented in a form which allows us to (a) see our assumptions on paper, and (b) include some of the dynamics of linkage. This presentation also indicates what our linkage-predictive approach can be moved beyond the level of a diagram used only to describe what happens in one instance of linkage, and toward an analysis of what happens in many linkages with varying levels of effectiveness. The trick, then, is to change operations, behaviors and attitudes to maximize those indicators which best predict the criteria of readiness, linkage, "first effects" of dissemination, and utilization. The ability to guide change is the final test of this or any other model.

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---------- Ideal Systems for Research Utilization: Four Alternatives. Ann Arbor: CRUSK, 1974.

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FIGURE 1

Analytical Framework for the Linkage Approach

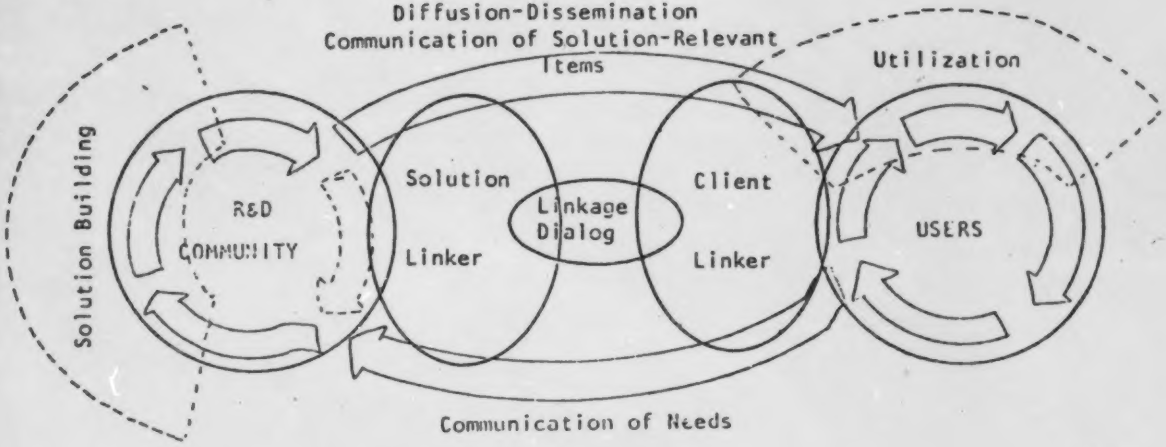

Diffusion-Dissemination
Communication of Solution-Relevant Items
Utilization
Solution Building
R&D COMMUNITY
Solution Linker
Linkage Dialog
Client Linker
USERS
Communication of Needs

FIGURE 2 The KPU Linkage-Predictive Model

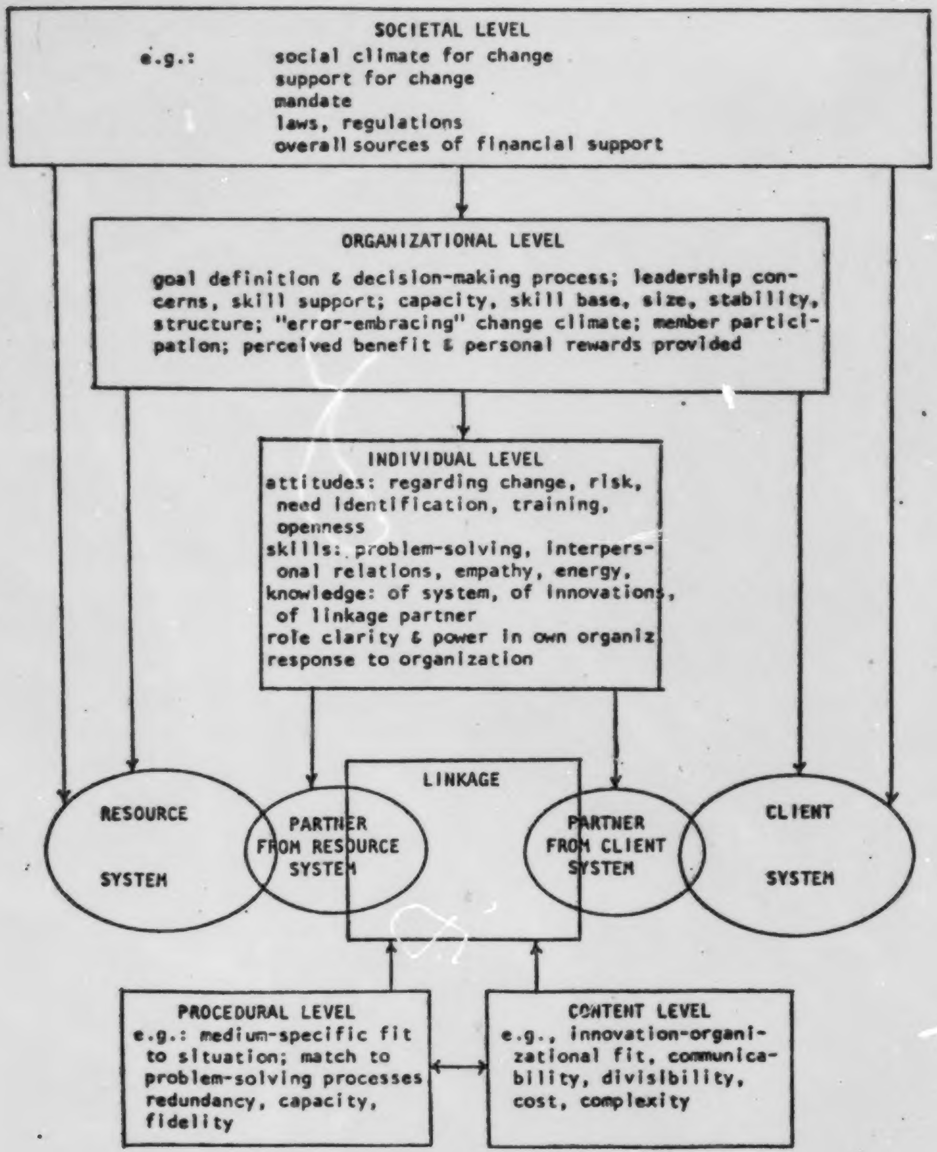
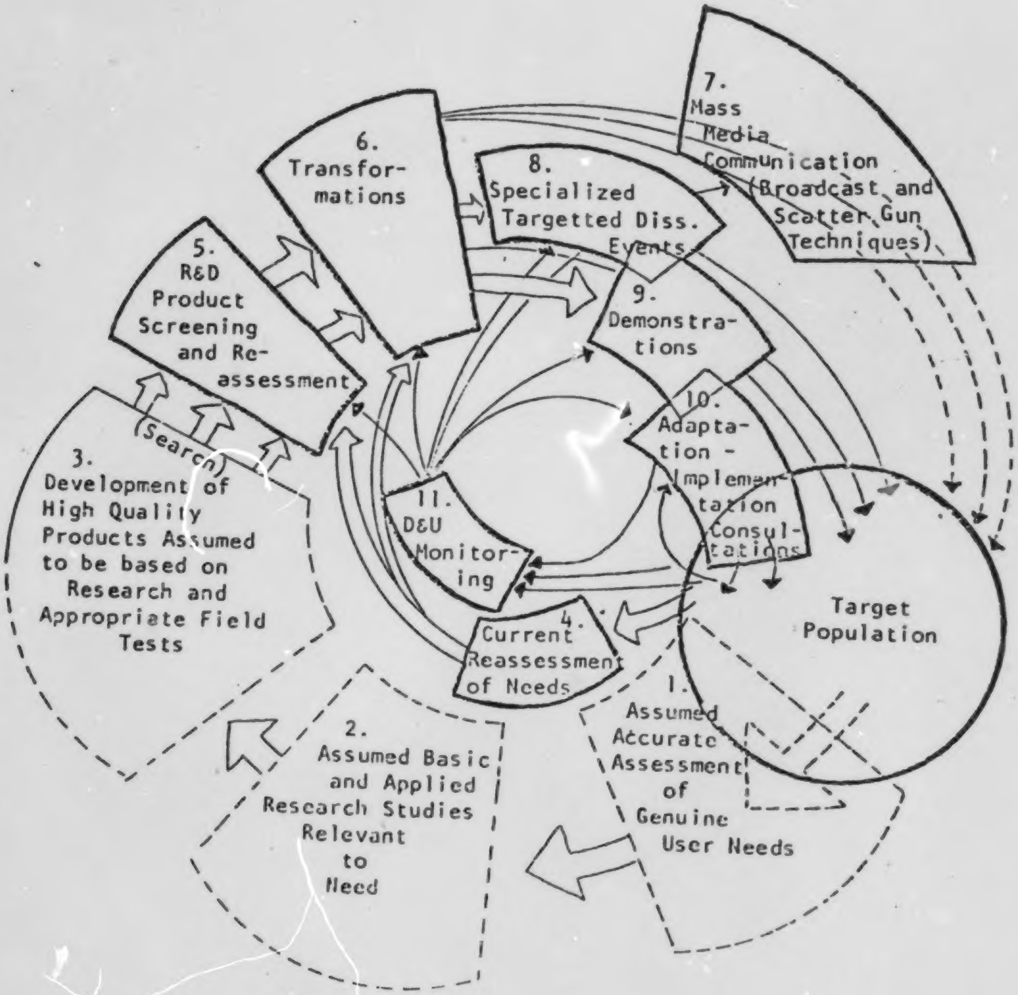
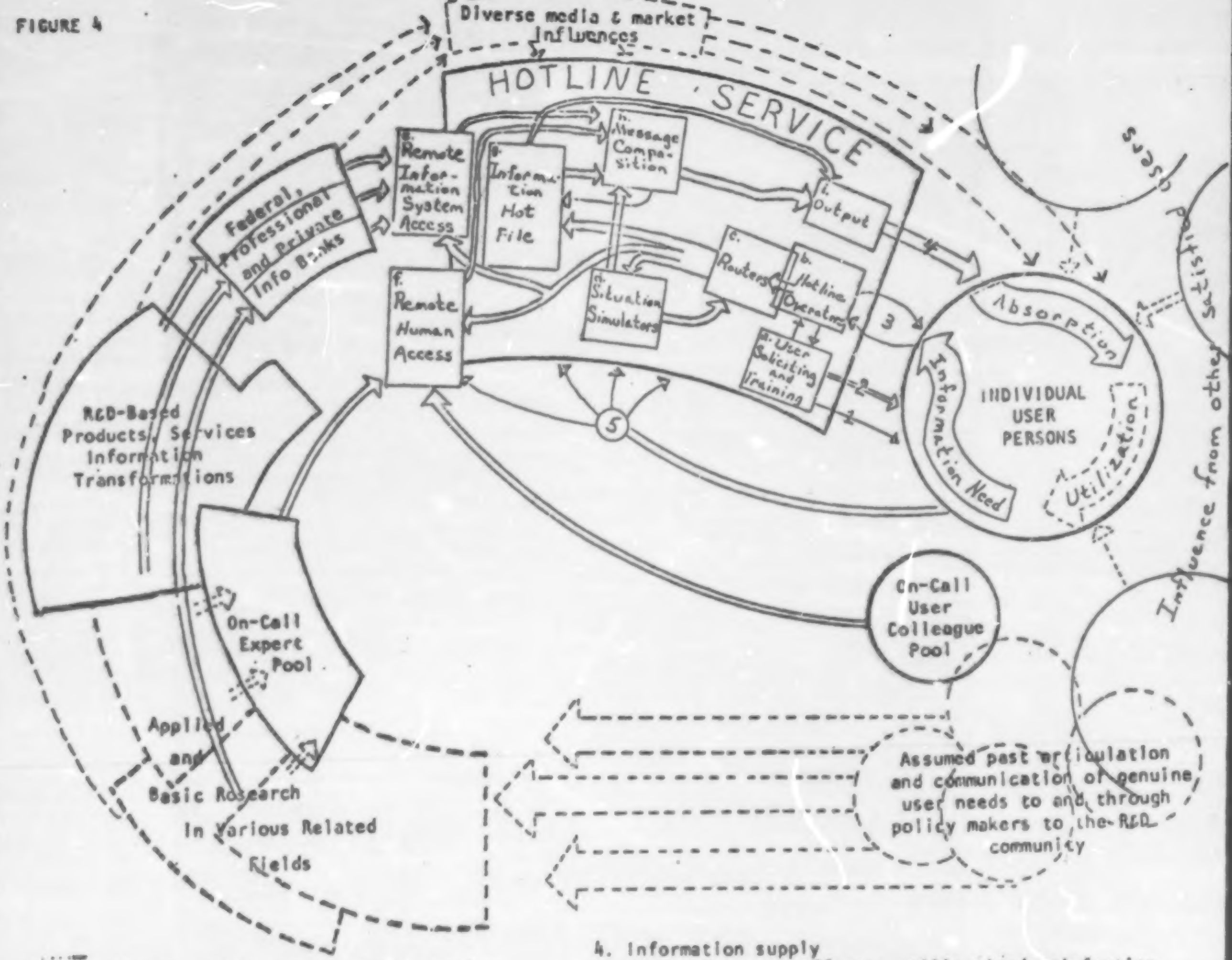

SOCIETAL LEVEL
e.g.: social climate for change
support for change
mandate
laws, regulations
overall sources of financial support
ORGANIZATIONAL LEVEL
goal definition & decision-making process; leadership concerns, skill support; capacity, skill base, size, stability, structure; "error-embracing" change climate; member participation; perceived benefit & personal rewards provided
INDIVIDUAL LEVEL
attitudes: regarding change, risk, need identification, training, openness
skills: problem-solving, interpersonal relations, empathy, energy,
knowledge: of system, of innovations, of linkage partner
role clarity & power in own organiz
response to organization
LINKAGE
RESOURCE SYSTEM
PARTNER FROM RESOURCE SYSTEM
PARTNER FROM CLIENT SYSTEM
CLIENT SYSTEM
PROCEDURAL LEVEL
e.g.: medium-specific fit to situation; match to problem-solving processes redundancy, capacity, fidelity
CONTENT LEVEL
e.g., innovation-organizational fit, communicability, divisibility, cost, complexity

FIGURE 3 Ideal Model of An R&D Product Dissemination Service


1. Assumed Accurate Assessment of Genuine User Needs
2. Assumed Basic and Applied Research Studies Relevant to Need
3. Development of High Quality Products Assumed to be based on Research and Appropriate Field Tests
(Search)
4. Current Reassessment of Needs
5. R&D Product Screening and Re-assessment
6. Transformations
7. Mass Media Communication (Broadcast and Scatter Gun Techniques)
8. Specialized Targetted Diss. Events
9. Demonstrations
10. Adaptation - Implementation Consultations
11. D&U Monitoring
Target Population

Total Time Frame: Stages 1-10: 10-50 years
For One Developed Product: Stages 4-10: 1-3 years

FIGURE 4


Diverse media & market influences
HOTLINE SERVICE
e. Remote Information System Access
g. Information Hot File
h. Message Composition
i. Output
c. Routers
b. Hotline Operators
a. User Soliciting and Training
d. Situation Simulators
f. Remote Human Access
Federal, Professional and Private Info Banks
R&D-Based Products, Services Information Transformations
On-Call Expert Pool
Applied and Basic Research In Various Related Fields
1
2
3
4
5
Absorption
Information Need
Utilization
INDIVIDUAL USER PERSONS
Satisfied users
Influence from others
On-Call User Colleague Pool
Assumed past articulation and communication of genuine user needs to and through policy makers to the R&D community

Stages of Activity at the Service-User Interface

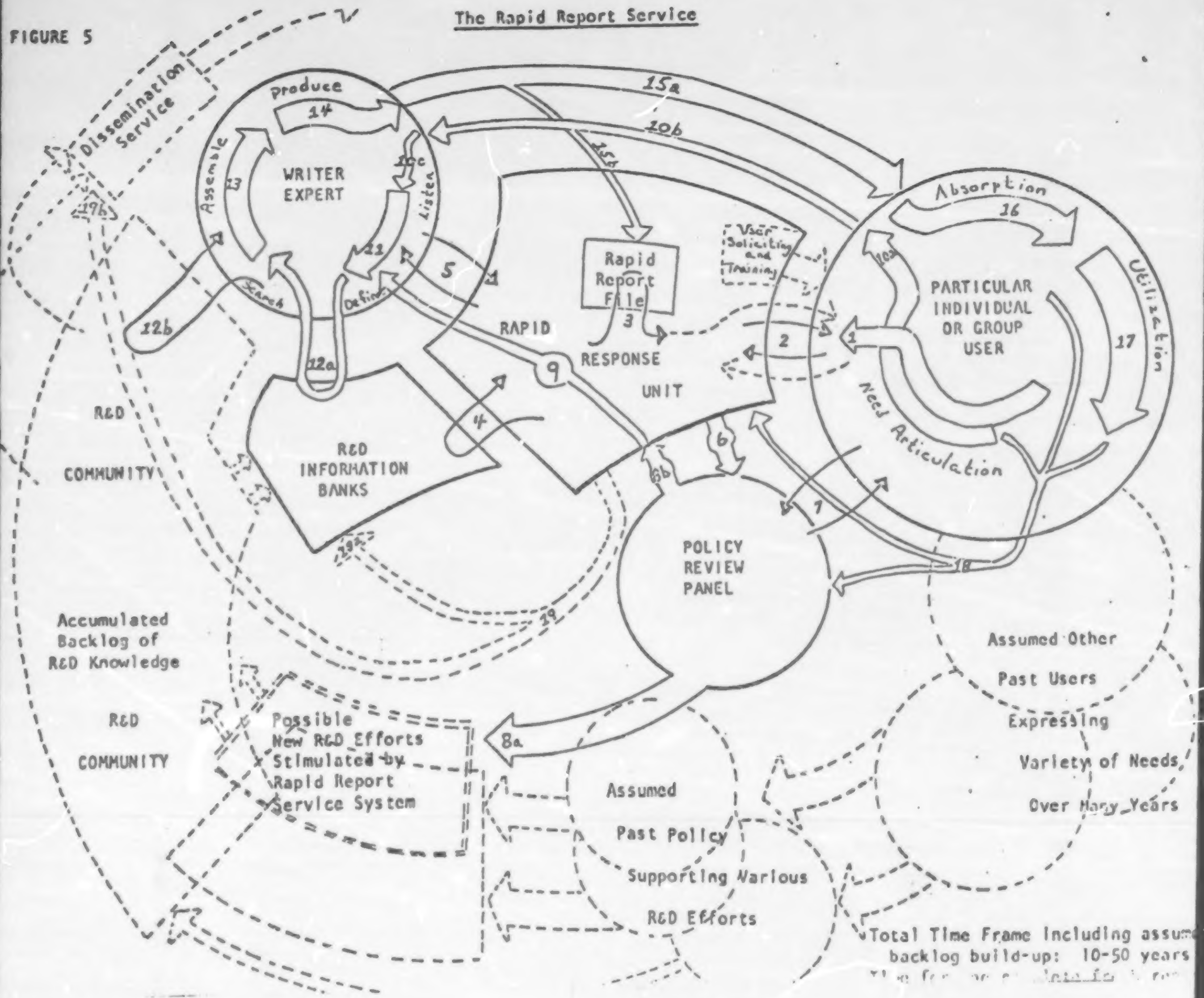
1. Service availability announcement
2. Demonstration

4. Information supply
5. Monitoring user effects: utilization/satisfaction

Time Frame to Service One Request (Interface Stages 3-4):

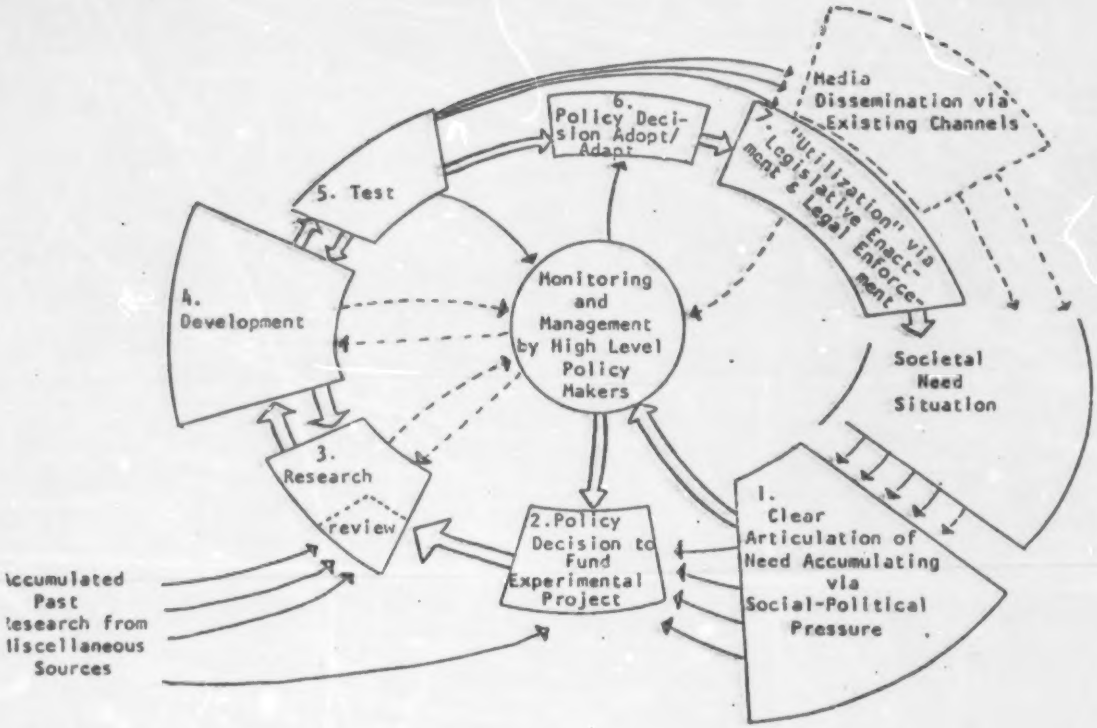
FIGURE 5

The Rapid Report Service


Dissemination Service
Produce
14
Assemble
13
WRITER EXPERT
10c
Listen
21
Search
Define
12b
12a
19b
15a
10b
15b
5
Rapid Report File
3
User Soliciting and Training
RAPID
RESPONSE
UNIT
9
4
2
1
10a
Absorption
16
Utilization
17
PARTICULAR INDIVIDUAL OR GROUP USER
Need Articulation
R&D INFORMATION BANKS
19a
19
6
6b
7
18
POLICY REVIEW PANEL
8a
R&D COMMUNITY
Accumulated Backlog of R&D Knowledge
R&D COMMUNITY
Possible New R&D Efforts Stimulated by Rapid Report Service System
Assumed Past Policy Supporting Various R&D Efforts
Assumed Other Past Users Expressing Variety of Needs Over Many Years

Total Time Frame Including assum
backlog build-up: 10-50 years
[illegible]

FIGURE 6 A Coordinated Mission-Oriented R&D Program


Media
Dissemination via
Existing Channels
6.
Policy Decision Adopt/
Adapt
7. "Utilization" via
Legislative Enactment & Legal Enforcement
5. Test
4.
Development
Monitoring
and
Management
by High Level
Policy
Makers
Societal
Need
Situation
3.
Research
review
2.Policy
Decision to
Fund
Experimental
Project
1.
Clear
Articulation of
Need Accumulating
via
Social-Political
Pressure
ccumulated
Past
esearch from
iscellaneous
Sources

Total Time Frame: From Initial Go-ahead Decision to Official "Utilization"
Stages 1 through 7: 5-10 years
Stages 2 through 7: 3-5 years

FIGURE 7 Ad Hoc User Research Services

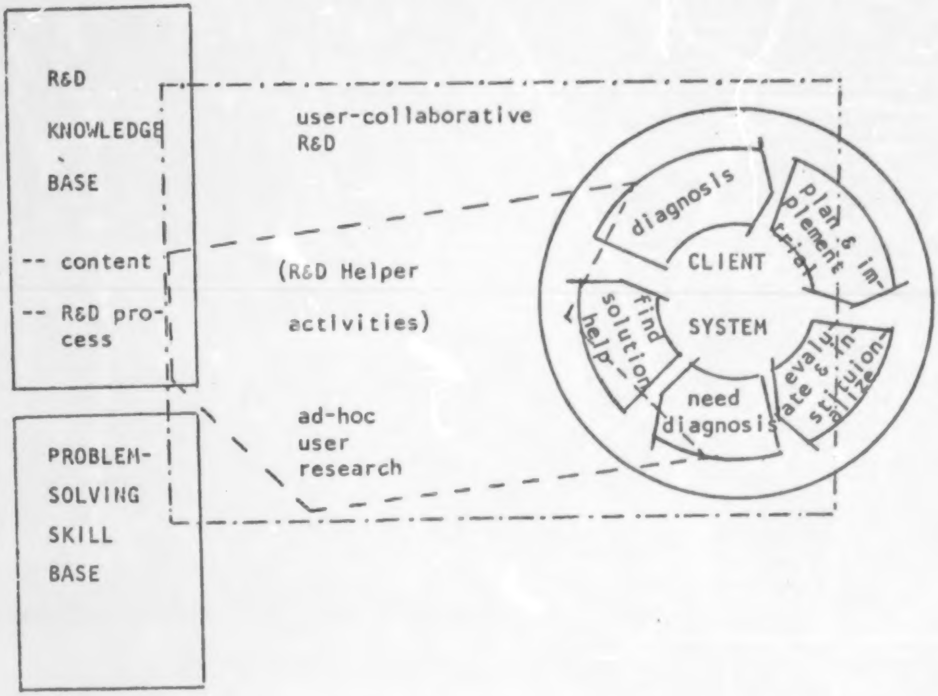
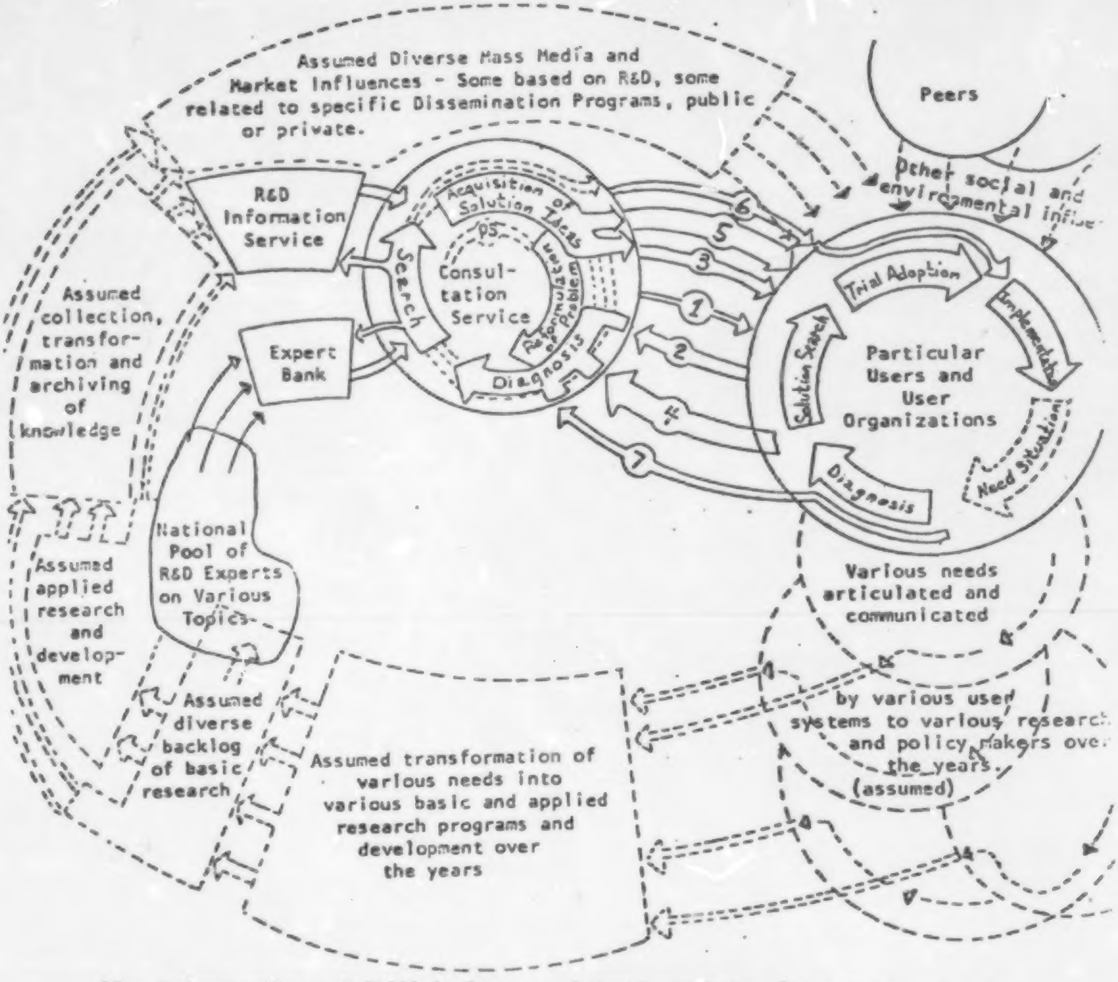

R&D
KNOWLEDGE
BASE
-- content
-- R&D process
PROBLEM-
SOLVING
SKILL
BASE
user-collaborative
R&D
(R&D Helper
activities)
ad-hoc
user
research
CLIENT
SYSTEM
diagnosis
plan & implement trial
evaluate & institutionalize
need diagnosis
find solution help

FIGURE 8 A Knowledge-Based Problem-Solving Consultation Service


Assumed Diverse Mass Media and Market Influences - Some based on R&D, some related to specific Dissemination Programs, public or private.
Peers
Other social and environmental influe
R&D Information Service
Expert Bank
Acquisition of Solution Ideas
PS
Consultation Service
Search
Reformulation of Problem
Diagnosis
6
5
3
1
2
4
7
Trial Adoption
Implementation
Solution Search
Particular Users and User Organizations
Need Situation
Diagnosis
Assumed collection, transformation and archiving of knowledge
Assumed applied research and development
National Pool of R&D Experts on Various Topics
Assumed diverse backlog of basic research
Assumed transformation of various needs into various basic and applied research programs and development over the years
Various needs articulated and communicated
by various user systems to various research and policy makers over the years. (assumed)

PS = Understanding and Skill in Process of Problem-Solving (Dotted lines inside Consultation Service)

Stages in Problem-Solving Dialogue

1. Client finding - relationship building - creating awareness of service.
2. Initial information/product/service requests.
3. Provisional knowledge supply/derivation of action implications from R&D.
4. Redefined comprehensive knowledge request.
5. Revised comprehensive knowledge/service/help supply.
6. Follow-up on adaptation, implementation.
7. Feedback on impact of knowledge, value of services provided.

Total Time Frame including build-up of assumed backlog of R&D: 10-50 years or more
To complete one P-S dialogue sequence: 2 months-2 years

FIGURE 9 Summary of Important Aspects of the Operational Modes

	SOLUTION-PROVIDERS				LINKAGE MECHANISMS		CLIENT SYSTEM			
OPERATIONAL MODES	Level of Planning	Degree of Centralization	Power Over Solution Content	Relation to Delivery Mechanism	Type of Contact	Duration of Linkage	Need-Sensing	Power Over Solution Content	Relation to Delivery Mechanism	Adaptation/ Adoption Aids
8 Natural Network (used for Internetwork linkage)	low	low	high and member-controlled	individual cross net connections	largely interpersonal	varies	unstructured	low	catch as catch can	none
6 Continuous Flow Dissemination	low	medium	high	media planning & format	impersonal	brief but recurring	minimal & normative	none	take it or leave it	minimal
2 R&D Product Dissemination Service	medium-low	high	high	built to order	impersonal & interpersonal	moderate	normative	slight in product screening	interactive at demo. & adaptation stage	consultation
4 Instant Response R&D Service	high	medium	medium	interactive with operators	interpersonal, client-initiated	brief	individualistic	some with hotline, more with human resources	interactive throughout	minimal at best
5 Rapid Response R&D Report Service	high	high	medium	service role	interpersonal & print	varies	individualistic	medium high: pay for what needed in base	interactive with power of approval	in sense that delivered product is highly tailored
1 Coor. Mission-Oriented R&D Program (a: for policy clients; b: practice)	high	high	medium	of lower importance	hi visibility reports & policy linkages	can be long a:	individualistic	participative	review	discuss & debate
						b:	normative indirect	low	indirect through regulation	added or funded later
7 Ad-hoc User Research Services	low to moderate	low	moderate, participative	collaborative	interpersonal	can be long	individualistic; defines type of project	moderate; still an R&D project	participative in deciding form	usually added to end of R&D process
3 Knowledge Based Problem Solving Consultation	low to moderate	low	moderately low; participative	collaborative	interpersonal	can be long	individualistic	hi: solution open to fit problem	participative in process	extensive

FIGURE 10 Client-Related Linkaged in RDx

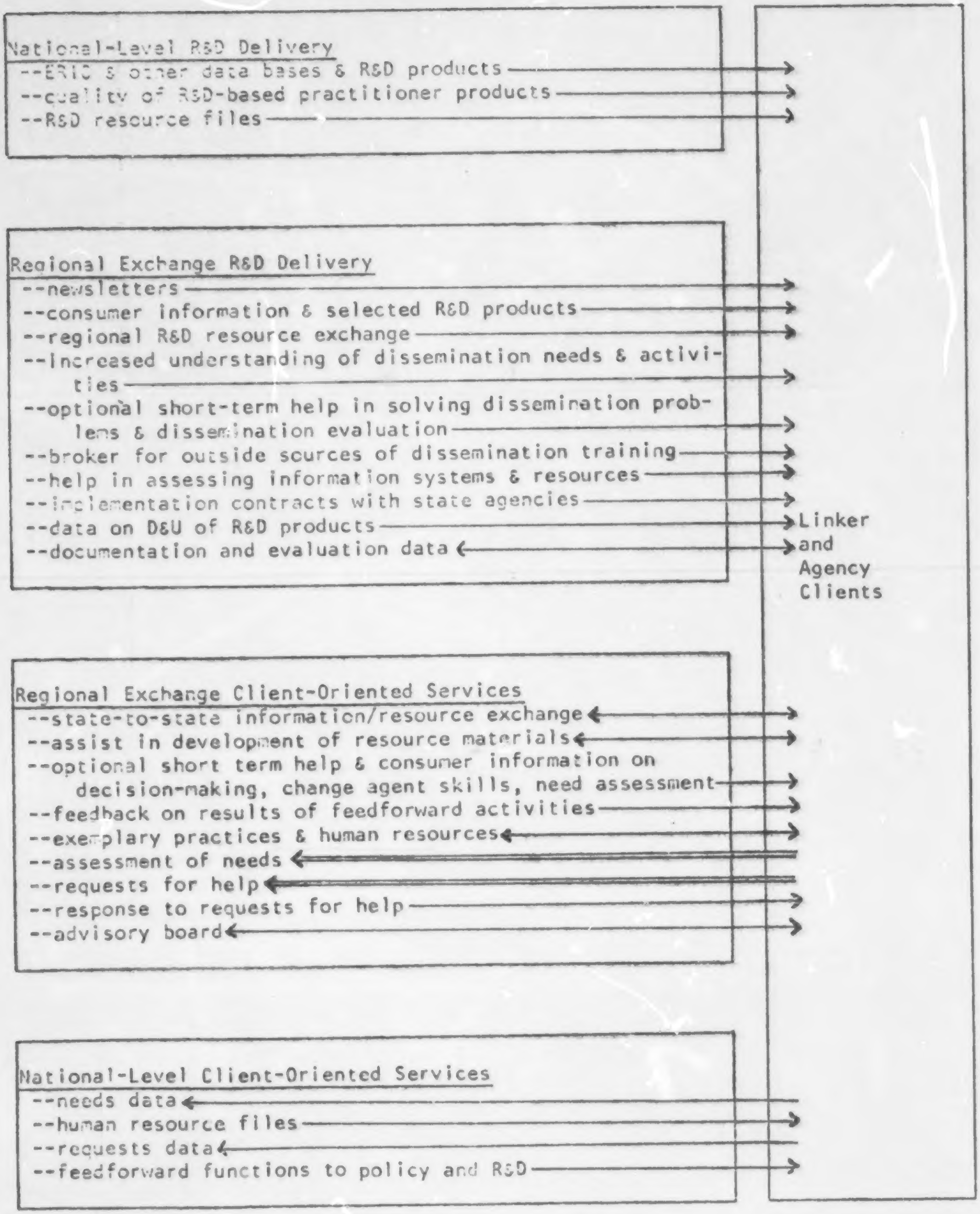

National-Level R&D Delivery
--ERIC & other data bases & R&D products
--quality of R&D-based practitioner products
--R&D resource files
Regional Exchange R&D Delivery
--newsletters
--consumer information & selected R&D products
--regional R&D resource exchange
--increased understanding of dissemination needs & activities
--optional short-term help in solving dissemination problems & dissemination evaluation
--broker for outside sources of dissemination training
--help in assessing information systems & resources
--implementation contracts with state agencies
--data on D&U of R&D products
--documentation and evaluation data
Regional Exchange Client-Oriented Services
--state-to-state information/resource exchange
--assist in development of resource materials
--optional short term help & consumer information on decision-making, change agent skills, need assessment
--feedback on results of feedforward activities
--exemplary practices & human resources
--assessment of needs
--requests for help
--response to requests for help
--advisory board
National-Level Client-Oriented Services
--needs data
--human resource files
--requests data
--feedforward functions to policy and R&D
Linker and Agency Clients

FIGURE A-1

PREDICTORS AND PROCESSES OF LINKAGES OVER TIME

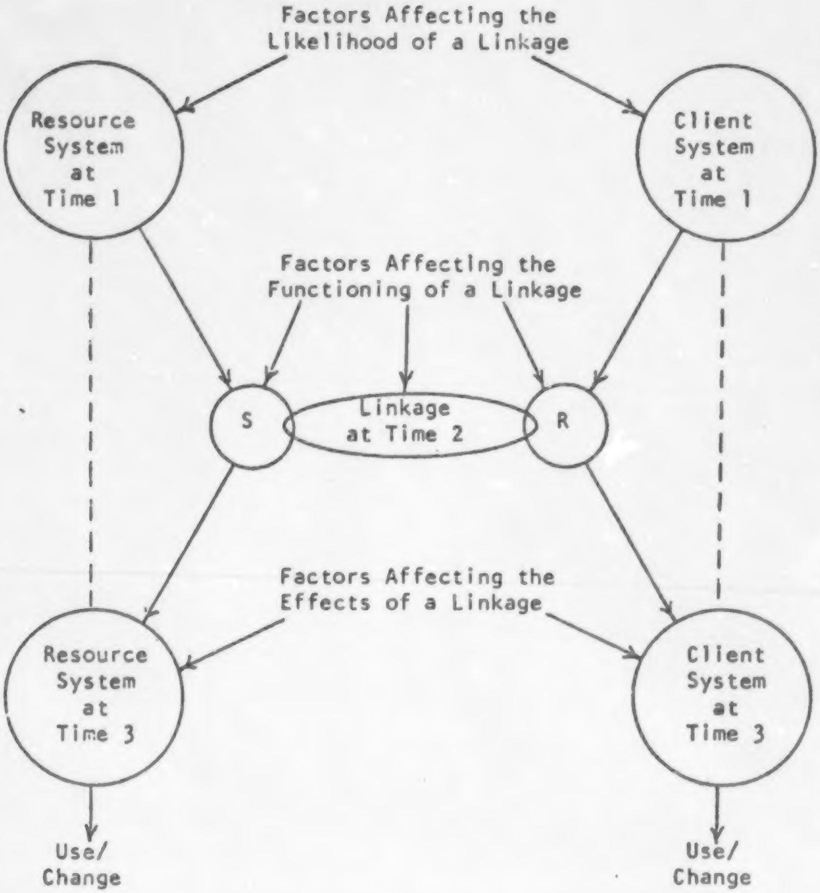
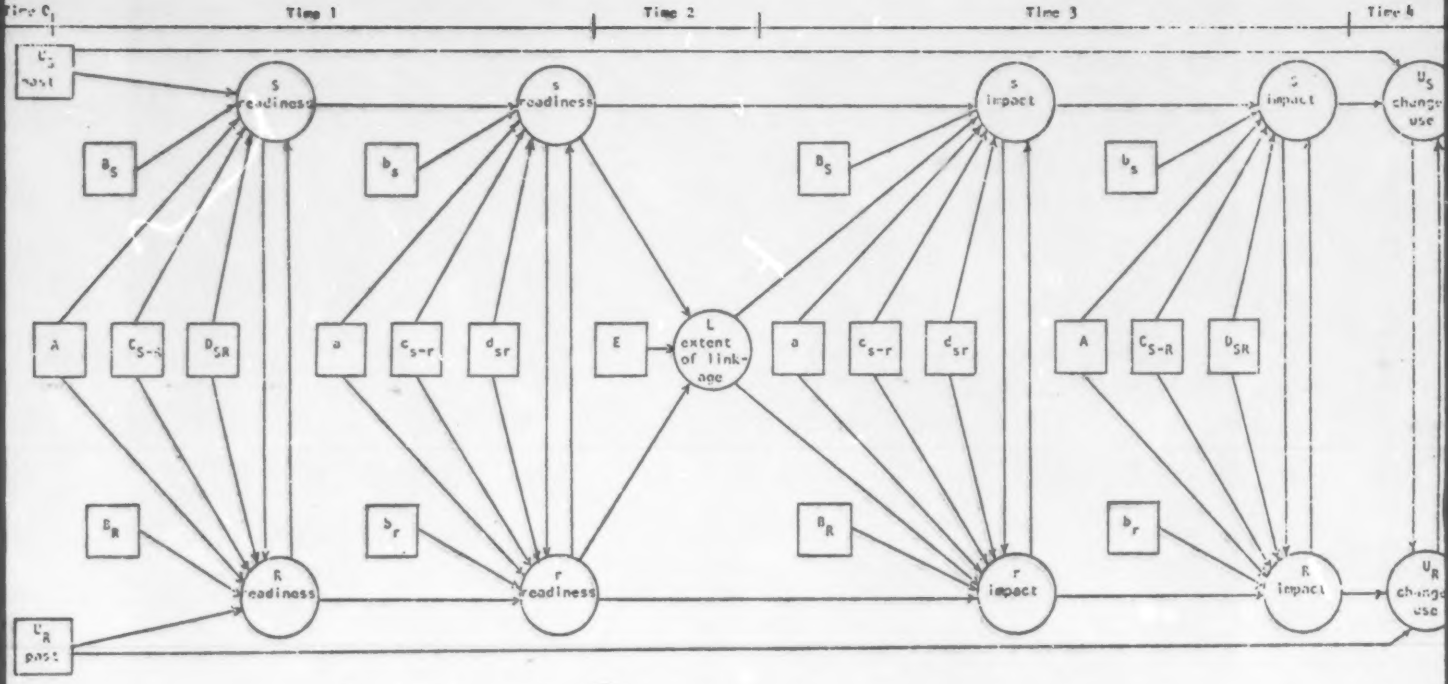

Factors Affecting the Likelihood of a Linkage
Resource System at Time 1
Client System at Time 1
Factors Affecting the Functioning of a Linkage
S
Linkage at Time 2
R
Factors Affecting the Effects of a Linkage
Resource System at Time 3
Client System at Time 3
Use/ Change
Use/ Change

FIGURE A-2 Basic Structural Equation Model of KPU Linkage


Time 0
Time 1
Time 2
Time 3
Time 4
U_S past
S readiness
s readiness
s impact
S impact
U_S change use
B_S
b_s
B_S
b_s
A
C_S-R
D_SR
a
c_s-r
d_sr
E
L extent of linkage
a
c_s-r
d_sr
A
C_S-R
D_SR
B_R
b_r
B_R
b_r
R readiness
r readiness
r impact
R impact
U_R change use
U_R past

Key: Criterion concepts = ○

Predictor concepts = □

FIGURE A-3 Structural Equations Model of KPU Linkage

Predicted (Endogenous) Concepts (η)

Predictor (Exogenous) Concepts (ξ)

$$
\begin{array}{ll|ccccccccccc|}
 & & \multicolumn{4}{c}{T_1} & T_2 & \multicolumn{4}{c}{T_3} & \multicolumn{2}{c}{T_4} \\
 & & S & R & s & r & L & s & r & S & R & U_s & U_r \\
\hline
T_1 & S & & \beta_1 & & & & & & & & & \\
 & R & \beta_2 & & & & & & & & & & \\
 & s & \beta_3 & & & \beta_4 & & & & & & & \\
 & r & & \beta_5 & \beta_6 & & & & & & & & \\
T_2 & L & \beta_7 & \beta_8 & \beta_9 & \beta_{10} & & & & & & & \\
T_3 & s & & & \beta_{11} & & \beta_{12} & & \beta_{13} & & & & \\
 & r & & & & \beta_{14} & \beta_{15} & \beta_{16} & & & & & \\
 & S & & & & & & \beta_{17} & & & \beta_{18} & & \\
 & R & & & & & & & \beta_{19} & \beta_{20} & & & \\
T_4 & U_s & & & & & & \beta_{21} & & \beta_{22} & & & \beta_{23} \\
 & U_r & & & & & & & \beta_{24} & & \beta_{25} & \beta_{26} & \\
\hline
\end{array}
\begin{pmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \\ \eta_4 \\ \eta_5 \\ \eta_6 \\ \eta_7 \\ \eta_8 \\ \eta_9 \\ \eta_{10} \\ \eta_{11} \end{pmatrix}
=
\begin{array}{|ccccccccccccccccccccccc|}
\multicolumn{2}{c}{T_0} & \multicolumn{10}{c}{T_1} & T_2 & \multicolumn{10}{c}{T_3} \\
U_s & U_r & A & B_s & B_r & C & D & a & b_s & b_r & c & d & E & A & B_s & B_r & C & D & a & b_s & b_r & c & d \\
\hline
\nu_1 & \nu_2 & \nu_3 & \nu_4 & & \nu_5 & \nu_6 & & & & & & & & & & & & & & & & \\
\nu_8 & \nu_9 & \nu_3 & & \nu_{10} & \nu_5 & \nu_6 & & & & & & & & & & & & & & & & \\
\nu_{11} & \nu_{12} & & & & & & \nu_{13} & \nu_{14} & & \nu_{15} & \nu_{16} & & & & & & & & & & & \\
\nu_{17} & \nu_{18} & & & & & & \nu_{13} & & \nu_{19} & \nu_{15} & \nu_{16} & & & & & & & & & & & \\
 & & & & & & & & & & & & \nu_{20} & & & & & & & & & & \\
 & & & & & & & & & & & & & & & & & & \nu_{21} & \nu_{22} & & \nu_{23} & \nu_{24} \\
 & & & & & & & & & & & & & & & & & & \nu_{21} & & \nu_{25} & \nu_{23} & \nu_{24} \\
 & & & & & & & & & & & & & \nu_{26} & \nu_{27} & & \nu_{28} & \nu_{29} & & & & & \\
 & & & & & & & & & & & & & \nu_{26} & & \nu_{30} & \nu_{28} & \nu_{29} & & & & & \\
\nu_{31} & & & & & & & & & & & & & & & & & & & & & & \\
 & \nu_{32} & & & & & & & & & & & & & & & & & & & & & \\
\hline
\end{array}
\begin{pmatrix} \xi_1 \\ \xi_2 \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \xi_{22} \\ \xi_{23} \end{pmatrix}
+
\overset{\text{(error)}}{\begin{pmatrix} \zeta_1 \\ \zeta_2 \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \zeta_{10} \\ \zeta_{11} \end{pmatrix}}
$$

CHAPTER EIGHT

INTERORGANIZATIONAL RELATIONS PROBLEMS IN THE DESIGN AND IMPLEMENTATION OF THE RESEARCH AND DEVELOPMENT EXCHANGE*

October, 1977

Charles Mojkowski
Neal Gross

---

*The authors wish to express their appreciation to Evelyn Fisher, William Conrad, Robert Stephens, Donald Erickson, Gregory Benson, Cheryl Hutchinson, Mary Saily, and Milton Goldberg for participating in a conference that explored issues discussed in this paper.

OVERVIEW

I

The task of designing the arrangements, processes, and strategies of a major organizational mechanism such as the RDx is a complex and challenging assignment. Making operational and modifying drawing board specifications so that they are congruent with and will facilitate the achievement of organizational functions and specific objectives generally are even more complex and challenging activities.

The designers of new organizations typically give primacy to their internal operations and problems on how they bear on the achievement of their goals. Designers generally devote less time and effort to consideration of the external affairs of the organization and to the types of interorganizational arrangements and strategies that will facilitate the accomplishment of organizational goals and the reduction of externally rooted impediments to their achievement.

In the case of the Regional Exchanges, we believe that their interorganizational relationships need to be placed on center stage for several reasons: first, the accomplishment of their missions will require them to develop productive working relationships with other organizations; second, the performance of members of the dissemination networks in which they will be involved will influence materially their own performance; and third, the success or failure of the Regional Exchanges will be a function of the behaviors of members of their organizational role set.

This paper focuses on the interorganizational relations of Regional Exchanges with special reference to a set of important problems that we believe deserve priority consideration in designing them and in attempting to implement their programmatic efforts. The specific objectives of the paper are as follows:

1) to alert officials who design the Regional Exchanges and those who will be responsible for their operation of a number of serious impediments that have arisen when largely autonomous organizations have been involved in collaborative activities and that have served as barriers to developing productive and harmonious interorganizational relationships
2) to examine the implications of these potential obstacles to productive interorganizational relationships for the design and operation of the Regional Exchanges
3) to propose strategies and tactics that may serve to minimize their occurrence or dysfunctional consequences

Because we cannot deal with the entire RDx, and because we wish to provide specific, useful information, we focus our attention on the most important organizational entities involved in the RDx - the Regional Exchanges. To do a similar analysis for the entire RDx is beyond the present scope of effort. Furthermore, in our judgment, many of the propositions and the implications we draw from them for the Rxs are relevant to other components of the RDx.

At present the Rxs are dealing primarily with SEAs. For this reason, we focus our attention on these two organization types although we realize that the Rxs wish to reach out later to ISAs and large city school districts. Should such expansion take place we believe our propositions and proposals will remain applicable.

II

Prior to considering interorganizational problems and their relevance for Rxs, it is pertinent to discuss several background and related issues. These issues relate to two broad contexts: first, the role of the Rxs (and the RDx itself) in the Knowledge Production and Utilization (KPU) System; and second, the Rx as a part of an inter-organizational set.

Knowledge production and utilization has as functions the development and use of new knowledge. During the past few years, the dissemination function of KPU has been given an increasing amount of attention at all levels and particularly in the Education Division.

A corollary issue to the increasing attention being given to dissemination is the notion of developing a nationwide dissemination system. The goal is to design and implement a system in which all relevant groups and organizations at all levels play a well-defined and appropriate role.

As a recent entry into this complex configuration of organizations engaged in dissemination, the RDx is attempting to define a role for itself that will avoid conflict with existing organizations and contribute to the development of a nationwide dissemination effort.

The general problem to which the RDx is directed is the underuse or non-use of R&D outcomes by those practitioners at the school and school district levels. This situation is viewed as resulting from a complex series of factors. The major reason given for such underutilization is the faulty communication that exists between producers and consumers of R&D.

Posing the problem in this way moves the RDx to "solve" it through new tactics such as repackaging messages in different media or in creating new messages or communication channels between researchers and developers and practitioners. While communications systems need improvement, it is incorrect to assume that a failure to communicate or a lack of awareness is the major impediment to the optimal use of R&D outcomes is schools. By focusing on communications as the problem, we are led away from analyzing other reasonable hypotheses for non-use.

Reasons for non-use of R&D outcomes are several and poor communication channels and techniques are only a portion of the problem. RDx managers must recognize that this is so and that their ability to impact on the problem will be limited by the nature and scope of the interventions they propose.

That some form of nationwide dissemination system is possible or reasonable is questioned by Guba and Clark. Given the large number of agencies and organizations, given the lack of consensus regarding means and ends, and given the nature of the federal bureaucracy, they argue that a true system does not exist and may be impossible to create. In contrast to the Guba and Clark proposal, we find that some form of systemization is needed and is possible to develop.

The role of the Rxs in KPU is defined by their position in the complex set of organizations working in this area. If the critical variable is implementation of R&D outcomes by practitioners, the Rxs will likely have only an indirect and facilitating role in that outcome.

The marginality of the Rxs to outcomes in the operating system is a critical variable. For one thing, the Rxs must assume that agents and organizations closer to the practitioner and responsible for technical assistance in implementation are, in fact, capable and willing to take on that role using R&D outcomes. The Rxs must also assume that the other agents are even willing to participate in the communications system being developed for dissemination and feed-forward regarding R&D outcomes.

The Rxs exist within a configuration of organizations that perform similar or interrelated dissemination functions. Several characteristics of the organizations (both individually and as types) are relevant to an understanding of interorganizational relations issues.

Each of the member organizations in the set has its own internal organization problems. Also, since each of the major organizations are developing new or expanded roles in the area of dissemination, each organization tends to describe itself in terms of a potential or expected set of capabilities and accomplishments.

Our selection of the Rxs as the center of attention is based on the fact that it is the focal organization in the set and can influence most directly the success or failure of the RDx. Given this position, the following relations are viewed as important to the realization of the goals of the Rxs:

1) establishing credibility and trust
2) communicating openly and frequently
3) building a culture of collaboration

It is important to recognize that the organizations in the set vary on a number of important dimensions and that this variation can have major consequences for the perceptions and relations of the Rxs. Some of the more important dimensions along which members vary are:

1) number and type of functions
2) dissemination capabilities
3) organizational flexibility
4) disposition toward innovation
5) stability - instability
6) leadership capabilities, staff experience and competencies
7) stage and rate of development
8) involvement in "the inner circle"
9) relationships to school systems/a "reality" orientation
10) perceptions of RDx

There are many implications resulting from these background considerations for the interorganizational problems which the Rx must address. Rxs will need to take into account contextual factors in developing relationships with other organizations in the set. General guidelines may be possible to develop and functional in serving future modifications. It is not possible, however, to develop a set of rules for the future development of the system.

III

Three broad sets of interorganizational relations problems are apparent: 1) those dealing with roles and relationships; 2) those dealing with linkages, particularly interorganizational ones; and 3) those dealing with management of the focal organization - in this case, the RDx. The sets are interactive but are discrete enough to support treating them separately.

For each problem set, a small number of propositions are presented. These propositions concern barriers that can inhibit the establishment or maintenance of productive working relationships between two or more organizations engaged in a collaborative effort.

Propositions Relating to Roles and Relationships

Proposition 1: When a New Organization (NO) enters a territory to provide services similar in nature to those offered by Existing Organizations (EOs), there is a strong likelihood that some members of the EOs will perceive the NO as a threat to their own personal well-being and to the welfare of their organizations, despite the disclaimers of the NO.

Proposition 2: The greater the ambiguity or vagueness of the NOs functions and services as perceived by the EOs, the more likely the EOs will perceive the NO as a threat.

Proposition 3: A condition that has frequently constituted a serious impediment to programs developed or sponsored by a set of organizations is the role overload that develops for their members as a consequence of decisions to embark on collaborative programs.

Proposition 4: Organizational representatives that take the initiative in proposing cooperative or collaborative ventures with other organizations frequently overstate what they can accomplish, underestimate the time required to achieve objectives or underemphasize the constraints to which they will be exposed. They also often tend to be unrealistic about the contributions their organization will be able to make to the proposed undertaking. If the venture is launched, it does not take long for the participants to realize that they have agreed to participate in a collaborative activity that will draw upon their resources but will not achieve its stated objectives.

Propositions Relating to Interorganizational Linkages

Proposition 5: A circumstance that frequently inhibits the development of productive and harmonious relationships among organizations engaged in cooperative or collaborative ventures is the lack of mechanisms to facilitate open and frank communications in their relationships about substantive issues and procedural matters.

Proposition 6: The absence of groundrules in collaborative ventures among organizations or lack of clarity about them if they exist, can serve as a serious impediment to the development of effective interorganizational relationships.

Propositions Relating to Management

Proposition 7: Major contributing factors to the failure of ventures involving interorganizational relationships are frequently their weak or inept management and the lack of leadership exhibited by individuals who manage one or more of the participating organizations.

Proposition 8: A circumstance, implicit in many of those earlier considered, that has been centrally involved in the wreckage of interorganizational efforts, is poor planning. Organizations involved in joint endeavors have generally dealt with their collaborative activities in an essentially ad hoc manner.

Proposition 9: In establishing new organizations considerable time and effort is usually expended on designing their structural arrangements and preparing job descriptions. Much less attention is devoted to engaging in a careful search for and selecting personnel who possess the capabilities required to fill these positions in a competent manner. In consequence, the role performance of members of the new organization is often deficient in one or more important respects when they serve as its organizational representative.

Proposition 10: Lack of monitoring and feedback procedures can serve as a serious obstacle to cooperative or collaborative activities of a set of organizations.

IV

Although the problems we have identified frequently serve as barriers in the development of interorganizational relationships, they do not invariably. Thus, Rx managers may be able to avoid or minimize some of these barriers. Following are some observations on strategies and tactics which would appear to help reduce problems.

Programmatic efforts designed to reduce or eliminate obstacles to effective interorganizational relationships require systematic and continuing planning efforts directed at the identification of serious impediments that are likely to occur during different phases of the development of the collaborative venture. One strategy that may be highly functional in this respect is for an RDx staff to develop collectively an obstacle course flow chart that specifies the types of serious problems that will probably arise at different stages in its collaborative activities and attempts to identify their probable causes.

This type of planning activity, especially if conducted on a continuing basis, is functional for several reasons. First, it identifies potential barriers. Second, it focuses attention on their probable causes. Third, it leads to deliberations about courses of action that can be pursued to prevent the emergence of obstacles. Fourth, it alerts staff members to the impact that the activities of the RDx and their performance can have on reducing or enhancing the likelihood that potential obstacles will turn into serious problems. Fifth, viewing potential obstacles along a time-line can bring out in bold focus the connections and relationships among potential barriers to productive interorganizational relationships.

A second observation has reference to the impact that the kinds of interactions that occur in the initial phases of an RDxs relationships with members of its organizational set can have on the number and types of obstacles that will arise later on. More specifically, if officials of an RDx do not or cannot clearly specify at the outset of their relationship with members of its organizational set the functions it proposes to perform, or if members of the organizational set view their presentation as fuzzy, these conditions will probably result in serious impediments to their later collaboration efforts.

Our third observation about strategies and courses of action that can be employed to minimize the likelihood that serious interorganizational problems will arise concerns the priority that an RDx assigns to this function. If, we we have maintained, the development of effective working relationships with members of its organizational set is a basic prerequisite for the success of an RDx, then a top priority status needs to be assigned to this function. In operational terms, this means that the primary duties of one or more staff members should focus on monitoring the relationships between the RDx and members of its organizational set and alerting the organization to actual or potential impediments to its existing or planned programmatic efforts.

A fourth observation pertains to the utility of conceptual schemes or models for reducing impediments to collaborative efforts and to strengthen interorganizational relationships. One type of model that could be heuristic for these purposes would be a formulation that specifies the objectives of an RDx and then indicates the stages through which it must move in its relationships with members of its role set to achieve them.

Our fifth observation pertains to the importance of an RDx recognizing that the source of certain impediments to effective RDx-organizational set relationships may be needless constraints and outmoded regulations of external agencies in Washington, D.C. and in their region. An analysis of actual and potential interorganizational barriers from this perspective can result in efforts to remove these external conditions. If successful, they can result in the reduction of impediments to productive interorganizational relationships.

INTERORGANIZATIONAL RELATIONS PROBLEMS IN THE DESIGN AND IMPLEMENTATION OF THE RESEARCH AND DEVELOPMENT EXCHANGE

I

INTRODUCTION

Designing the arrangements, processes, and strategies for a major new organizational innovation such as an RDx is a complex and challenging assignment. Implementing them in ways that will maximize their contribution to the achievement of organizational objectives is an even more complex and challenging task.

Designers of new organizations typically give primacy to their internal operations and problems. They focus their efforts on developing the division of labor, authority structure, and system of roles and role relationships that they believe will provide the quantity and quality of outputs desired of the organization, whether they be products or services. They generally devote less time and effort to their external affairs. They seldom examine the types of interorganizational arrangements and strategies that will facilitate the accomplishment of organizational objectives or that will minimize externally based impediments to their achievement. Their deemphasis of interorganizational relations is undoubtedly a function of many conditions, including pressures to focus on internal operations and problems, uncertainties about the external environment, and lack of awareness of its importance for organizational functioning.

In designing Regional Exchanges (Rxs) however, it is essential for several reasons that their interorganizational relationships be placed on center stage from the outset. First, if they are to accomplish their missions they will need to develop and maintain productive working relationships with a number of other organizations. Second, the attitudes and performance of members of the dissemination networks in which they will be involved can be anticipated to influence materially the performance of an Rx. Third, the success or failure of a Regional Exchange will be largely a function of its skill in coping with problems that arise in working with members of its organizational set.

This chapter examines the interorganizational relations of Regional Exchanges with special reference to a selected set of problems that we believe deserve priority consideration in designing them and in attempting to implement their programmatic efforts. More specifically, its objectives are:

1) to alert officials who design Regional Exchanges and those who will be responsible for their operation to a number of serious impediments to productive and harmonious interorganizational relationships that have arisen when largely autonomous organizations have been involved in collaborative activities;

2) to examine the implications of these potential obstacles for the design and operation of Regional Exchanges;

3) to propose strategies and tactics designed to minimize or prevent their occurrence or dysfunctional consequences.

Our analysis focuses on the external relations of organizational units that are of strategic importance for the successful operation of the RDx - the Regional Exchanges. Many of the propositions to be presented and the implications for Rx's that we shall draw from them, however, may also have relevance for the design and operation of other components of the RDx.

The Rx's at present deal primarily with SEA's. However, it is our understanding that they later plan to work with other organizations such as ISA's and large city school districts. We therefore have viewed the interorganizational relationships of an Rx as including agencies it presently relates to and those with which it may become involved in the future.

II

BACKGROUND CONSIDERATIONS

To set the stage for our examination of barriers to productive interorganizational relationships and their implications for RX's, we consider initially two contextual issues: first, the role of the Rx's and the RDx in the Knowledge Production and Utilization System; and second, the interorganizational network or set in which Rx's are involved.

The Knowledge Production and Utilization System

Knowledge production and utilization (KPU) in education has been defined by Guba and Clark as "inventing, engineering, and testing solutions to operating problems in schools; disseminating knowledge throughout the community; and adapting, adopting, and institutionalizing solutions tp operating problems in educational units" (Guba and Clark, 1975).

During the past few years, the dissemination aspect of KPU has received increasing attention in educational circles. Earlier, it received less federal attention than the research and development components of KPU. Sieber (1975) views these shifts in emphasis as detrimental to the creation of a high quality RD&D system since he views balance as one of its essential requirements. Sieber's observations remind us that they are attempting to improve their capacities to become more effective disseminators, and that their efforts are supported in large part by federal funds. Efforts to develop a nationwide dissemination system also reflect the increasing consideration being given to dissemination. As in the case of R&D, the thrust has been directed to the creation of a "unified-systems view" of dissemination (Guba and Clark, 1975). The Reports of the Interstate Project on Dissemination (1976) and the Dissemination Analysis Group (DAG) (1977) and the RFP prepared for the RDx (1977) all stress the need for a nationwide dissemination system and the importance of designing and implementing one in which relevant groups and organizations participate.

As a recent entry into this complex configuration of organizations engaged in dissemination, the Rxs have attempted to define a constructive role for themselves that avoids conflict with existing organizations and contributes to the development of a nationwide dissemination effort. They have been primarily concerned with how to increase the use of R&D outcomes by practitioners at the school and school district levels. The underuse or non-use of R&D products is attributed by federal officials to a complex and interrelated set of factors. They view the most important contributing circumstance as faulty communication between producers and consumers of R&D. This point of view dominates the planning proposal for the Data Management contract (August, 1976). It presents a detailed analysis of weaknesses in present communication channels between producers and consumers and identifies their following deficiencies: 1) inadequate needs assessment and market research studies; 2) narrowly-conceived evaluation studies; 3) incomplete linkages; 4) consumer information not reaching target audiences; 5) poor quality of consumer information; and, 6) inadequate information for building needed capacities. These impediments are attributed primarily to faulty communications. It is expected that the Regional Exchanges will constitute mechanisms that will establish needed communication channels between producers and consumers and facilitate greater communications between them.

NIE's RFP for the RDx planning contracts stressed the same type of obstacles. Of the four objectives it specified for the Exchanges, three dealt with the need to improve communications. The fourth focused on "improving practitioners capability (sic) to make rational decisions to select and use high quality R&D and other outcomes." Although other barriers to optimal use of R&D outcomes are mentioned, it gives primary attention to the need to solve communication difficulties. Since dissemination problems have been defined primarily as communication problems, it is not surprising that the efforts of the RDxs have focused on developing new communication tactics, for example, repackaging messages in different media or on creating new kinds of messages or communication channels among researchers and developers and practitioners.

Few would question the importance of Rx activicies designed to improve communications. However, it deserves emphasis that the assumptions that communication obstacles and lack of awareness of innovations are the major impediments to the optimal use of the outcomes of R&D in schools may be tenuous (Deats, 1974). In addition, formulating the dissemination problem in this manner overlooks the possibility that a number of other circumstances may constitute important determinants of non-use of R&D products.

The explanation that identifies the key variables as deficiencies in the communications system assumes that educational products will be used and will solve school problems if educators are aware of them. Its assumptions are similar to those posited by Guba (1968) about the linear connections among research, development, and dissemination.

A basic premise underlying RDx activities is that lack of awareness of R&D products, has been the basic cause of their non-use. Lack of utilization, in turn, has been frequently cited as a primary reason for the lack of empirical data to determine the value of R&D. However, another possible explanation emerges if we view lack of awareness as a piece of important feedback: it may reflect the ineffectiveness of the overall R&D strategy and the tactics that have been used in efforts to create awareness. Other basic reasons for non-use or under-use may be that school personnel find little of value in R&D products or when they do, they are unable to implement them (Gross and Herriott, 1976). In short, in addition to poor communication channels and techniques, multiple factors undoubtedly need to be invoked to account for non-use of R&D outcomes. RDx managers need to recognize the complex nature of the dissemination problems of their organizations. If they define them unrealistically, the scope and nature of their interventions will be off-target (Thayer, 1973).

Guba and Clark (1975) have questioned whether a nationwide dissemination system is possible or meaningful. In view of the large number of agencies and organizations involved in dissemination, the lack of consensus about its objectives, disagreements about the most efficacious procedures to accomplish them, and persistent problems of the federal bureaucracy concerned with diffusion activities, they argue that a system does not in fact currently exist and it may be impossible to create one. They suggest that a "configurational" model, one that views educational KPU as less coordinated and controlled than is usually implied through the use of systems language, would be more functional. In contrast to the views of Guba and Clark, it is our position that greater systematization is needed. We contend that the present state of affairs is dysfunctional and that scarce resources are not being used efficiently or effectively. Instead of abandoning efforts to establish a nationwide dissemination system, we believe that it is possible to design and implement one that can be highly functional.

The role of an Rx in KPU will be primarily determined by the functions it performs for organizations in its area. If it defines its essential purpose as the facilitation of school district implementation of R&D products (Fullan and Pomfret, 1977), then an Rx could be expected to serve as a catalyst in efforts designed to achieve that outcome.

The marginal status of an Rx has important implications for its performance and relationships. For one thing, it implies that an Rx must assume that organizations in closer contact with the practitioner and responsible for technical assistance in implementation are, in fact, capable and willing to use R&D outcomes. It also implies that an Rx must assume that members of its organizational network are willing to participate in the communications system being developed for dissemination and feed-forward of R&D outcomes. These assumptions, however, may be tenuous in a number of Rx networks. Rxs also operate within a set of understandings about the way knowledge is disseminated. The shortcomings of present practice are the problems to which the Rxs must address themselves. Their managers will need to be knowledgeable about these problems and aware of the options available to Rxs for dealing with them.

Rxs and Their Organizational Sets

An Rx is not only a part of the KPU System. It is also embedded in a network of regional organizations that are engaged in dissemination functions of a similar or related nature. It is essential to recognize, however, that although the organizations with which an Rx will relate have similar concerns, they also can be expected to vary in important respects on a number of dimensions that will influence their perceptions of, and relationships with, an Rx. We now specify some of the more important dimensions on which members of an Rx's organization set may vary that can have significant effects on how they will relate to it.

The first is the number and intensity of their own internal problems. Among the organizations in a network, some of them, for example, the SEAs, may be already centrally involved in numerous and complex problems related to dissemination efforts and other functions and busily engaged in a multiplicity of activities designed to cope with them. Other organizational members, however, may have reached only the planning phase of their dissemination efforts. Furthermore, the member organizations in the set have their own unique internal organizational problems and this circumstance can be anticipated to influence the way that they respond to interorganizational issues of primary concern to an Rx. Since the number and types of problems to which these organizations are exposed vary greatly, their reaction and committment to and involvement in proposed collaborative ventures will also vary. In addition, within Rx regions the SEAs differ considerably with respect to their dissemination capacities. Among regions, some Rxs are more capable of providing technical assistance in dissemination than others. In consequence, the perceptions that different organizations will have of proposals about dissemination developed by an Rx can be anticipated to be highly disparate.

A second respect in which they can differ is in the scope and type of functions they perform. R&D Labs and Centers, for example, are concerned primarily with the production and transformation of knowledge whereas SEAs and ISAs perform many functions in addition to R&D, which usually is not perceived as one of their priority activities. A third way in which members of the organizational set can vary is in their dissemination capacities. Although a few of the SEAs appear to have developed comprehensive and coordinated dissemination programs, the capabilities of most members of the organization set of an Rx appear to be relatively immature. It also deserves note that the dissemination capabilities of some of the Rxs at present are as underdeveloped as those of the SEAs with which they are working. A fourth basis on which they vary is organizational flexibility. The constraints under which member organizations operate may vary greatly and they can affect their ability to allocate resources to new efforts, establish new organizational units, and to collaborate with other organizations in the set.

A fifth basis on which they may vary is in their predisposition to become involved in a new set of interorganizational relationships.

Some organizations may feel threatened by the new endeavor, whereas others may welcome it. A sixth basis on which they may vary is in terms of their probable organizational longevity. While SEAs are likely to be present for a long time, the longevity of an Rx is uncertain. Furthermore, the turnover in personnel working in Rxs and other insecure organizations, may inhibit the development of productive working relationships. The fact that the Rxs are dependent on NIE for funding affects their stability in view of its annual budgetary difficulties. A seventh differentiation is in their leadership capabilities, staff experience and competencies. The organizations can be expected to vary in their capabilities to offer leadership to dissemination efforts. They also can be anticipated to vary in the knowledge, technical skills and human relations of their staffs.

An eighth respect in which they may vary is in their stage of development as a dissemination agency. For example, some SEAs within the organizational set of an Rx may be in the early stages of developing dissemination services whereas others may have already launched substantial programs. A ninth basis on which they may differ is in their involvement in "the inner circle". Because communication does not flow uniformly and regularly through a configuration of organizations, an "insiders-outsiders" situation can readily occur. Critical information tends to be shared among a select subset of organizations in individuals. A tenth difference is in the degree to which they are in close contact with school systems. Organizations in the set that have direct and on-going contacts with local school districts will perceive themselves as being more in touch with reality than those that have limited contacts with educational practitioners.

An eleventh way in which members of the organizational set can differ deserves special emphasis because it can markedly influence their perceptions of RDx. The Regional Exchanges and the support contractors are components of individual Labs or Centers and are thus controlled by them. This circumstance has resulted in the belief that the Rxs were created to serve Labs and Centers by disseminating their products to practitioners. Lingwood addresses this issue in his paper in this volume.

Since organizations in an Rxs network can vary in so many respects, this circumstance will exacerbate its interorganizational problems. It will need to be constantly taken into account in working with other organizations of the set. The differences that exist among the agencies involved in the organizational set of an Rx suggests that its services to its clients be tailor-made. By maintaining flexible arrangements with them, the Rxs should be able to address the individual needs of each SEA or ISA. Flexible arrangements will also be required in the relationships between Rxs and Washington. What is needed is guidelines that are broad enough to permit customization of an Rx's strategies and tactics.

III

INTERORGANIZATIONAL RELATIONS PROBLEMS

Serious impediments to the development of productive working relationships among organizations engaged in collaborative ventures can readily arise. We now consider obstacles of this kind of special relevance to the interorganizational relationships of the RDx.

Three types of issues will be examined. The first focuses on organizational role problems and those involving staff overload. The second concerns deficiencies in interorganizational linkage arrangements. The third deals with management and leadership problems. For each issue to be considered, We shall present and briefly discuss one or more propsitions and then inquire about their implications for the design of an Rx with special reference to the development of productive working relationships among members of its organizational set.

Organizational Role and Staff Overload Problems

New Organizations as Perceived Threats

Proposition 1: When a New Organization (NO) enters a territory to provide services similar in nature to those offered by Existing Organizations (EOs), there is a strong likelihood that some members of the EOs will perceive the NO as a threat to their own personal well-being and to the welfare of their organizations, despite the disclaimers of the NO.

Proposition 2: The greater the ambiguity or vagueness of the NOs functions and services as perceived by the EOs, the more likely the will perceive the NO as a threat.

As noted, the increased attention given to dissemination at all levels of education in recent years has resulted in a multiplicity of agencies being engaged in this function. In consequence, when an Rx initiates its activities, it will be entering an arena in which a substantial number of organizations are already involved. Organizations such as SEAs and the ERIC Clearinghouses might readily perceive that an Rx will engage in tasks that duplicate those in which they are already involved or plan to undertake.

As a recent entry into the configuration of organizations engaged in dissemination, Rxs have attempted to carve out a role for themselves that would minimize conflict with agencies in their organizational network and that would contribute to the development of a nationwide dissemination effort. However, this definition of the role of an Rx lacks specificity. Agencies such as an SEA can be expected to be reluctant to work with an Rx since they are unclear about its specific tasks and whether it will attempt to take over some of their functions. Since the unique contributions of the Rxs remain unspecified in existing government documents, there appears to be justification for their concerns.

The role definition problem also presents a dilemma for the Rxs. On the one hand vague and broad statements of their purpose make it difficult for them to justify their existence. From a marketing perspective (Kotler et al., 1977), their specification of a distinct "product line" or service is essential. On the other hand, specific statements of purpose leave them little room to negotiate and compromise with members of their organizational sets.

Another aspect of the role definition problem is that some SEAs, ISAs, and LEAs do not perceive Labs and Centers as having a strong previous track record in providing them with useful services. As Bean and Rogers (1977) indicate, research activities in education appear to be conducted largely in response to researcher's needs. Labs and Centers, therefore, often find themselves in the position of attempting to find practical uses for their research and development results. The practice of "matching" research outcomes to practitioner needs, however, is increasingly being viewed as a dubious procedure since it often results in a "change advocacy" role which increasingly is being seen as an impediment to implementation (Kotler et al., 1977; Rogers and Bean, 1977; Fullan and Pomfret, 1977). The statement that one of the objectives of an Rx should be "improving practitioners capability (sic) to make rational decisions to select and use high quality R&D and other outcomes" implies that: (1) an Rx will work frequently with LEAs; (2) LEAs frequently do not make rational decisions; and (3) many LEAs lack the capabilities for rational decision-making (underlining ours). The first statement is incongruent with other pronouncements of RDx and could readily be viewed as threatening by SEAs and LEAs. The other two may have some basis in fact. However, they could readily be misconstrued and could have serious negative public relations consequences for an Rx.

Implications

In view of the role definition problems confronting the Rxs, Propositions 1 and 2 have important implications for them. They imply that Rxs must deliver useful products or services which are perceived by SEAs, ISAs, LEAs, and other clients as filling major unmet dissemination needs or as having a distinct advantage over other available products and services. The propositions also imply that Rxs will need to validate their pronouncements about their intentions as quickly as possible. If they do not, they can anticipate exposure to increasing distrust. To achieve these objectives, one or more of the following strategies or tactics may be highly functional for an Rx: (1) initiate relatively quickly a modest project or activity that serves to validate the Rxs public definition of its role; (2) provide constant reassurance to EOs to reduce fears or uncertainties they may have; (3) involve officials with stature and power at the national level in meetings with the EPs to corroborate Rxs statements about its functions and role; (4) establish a consortium-type arrangement in which the EOs and the Rx jointly agree to a division of labor with regard to their respective regional tasks; (5) develop a written agreement acceptable to all parties about their respective roles, rights and obligations in their collaborative or conjunctive relationships and undertakings; (6) maximize "natural processes" already in existence that facilitate trust and confidence, (Zaltman and Sikorski, 1977) especially in the early stages of relationship-building; and (7) make clear to EOs the rewards and benefits to be derived from collaborating with an Rx.

Role Overload for Organizational Members

Proposition 3: A condition that has frequently constituted a serious impediment to implementing programs developed or sponsored by a set of organizations is the role over-load to which its members are exposed as a consequence of their participation in them.

Organizations that become involved in collaborative ventures generally fail to consider whether their staffs will be able to carry out in a competent manner, duties necessitated by their new relationships.

Their personnel frequently cannot behave in this manner since their time is already fully committed or they lack the required skills. When organizational members are required to assume added responsibilities, it often results in their being assigned time consuming tasks which they have difficulty in completing and that compete with their ongoing duties. Exposed to incompatible expectations, they find it difficult or impossible to carry out both their old and new responsibilities effectively. The role overload and role strain they experience results in personal feelings of ambivalence, frustration, and stress. These conditions can also have organizational and interorganizational effects: their organizations will find it difficult or impossible to conform to the expectations of the other organizations with whom they are collaborating and to meet their commitments to them. In short, interorganizational programs can suffer as a result of the failure of their members to examine in a hard headed manner the new role demands that their collaborative endeavors will entail and their capabilities to fulfill them. In seeking to get its foot in the dissemination door, an Rx may be sorely tempted to attempt to meet most or all of the demands of the SEAs and other agencies in its organizational set. If it follows this approach an Rx will be promising services which are beyond its capacity to deliver, either because of time or personnel limitations. Unmet expectations in situations of this kind generally have dsyfunctional effects on subsequent interorganizational relationships.

Implications

Proposition 3 implies that, in developing new programs of a cooperative or collaborative nature with members of its organizational set, an Rx needs to determine their capabilities to implement their proposed responsibilities. It also needs to examine its own capabilities to carry out its proposed commitments. If the Rx or other members of the organizational set lack the personnel and other resources required to carry out their assigned duties and if these deficiencies cannot be corrected, then there is little point in embarking upon the collaborative effort since there is little likelihood that it can be implemented. Furthermore, the proposition suggests that Rxs may need to give serious consideration to the following idea subscribed to by some management consultants: when an organization or a set of organizations decide to perform a new function, they probably need to establish a new set of structural arrangements and roles for its accomplishment. This strategy by-passes the problems of role overload and role strain and permits the development of a tailor-made set of arrangements to accomplish a new function or mission.

Unrealistic Claims

Proposition 4: Organizational representatives involved in cooperative or collaborative ventures with other organizations frequently overstate what they can accomplish, underestimate the time required to achieve proposed objectives or underemphasize the constraints to which they will be exposed. They also often tend to be unrealistic about the contributions their organization will be able to make to the proposed undertaking. If the venture is launched, it does not take long for the participants to realize that they have become involved in a collaborative activity that will draw upon their limited resources but has little probability of achieving its stated objectives.

Members of an organizational set can be expected to overstate their past accomplishments and their actual or potential capabilities for many reasons, for example, unbridled enthusiasm, lack of experience, or incompetency. Regardless of its cause, this lack of realism generally results in distrust for, and negative reactions to, some organizations in the set. If an Rx engages in this type of behavior, it will reduce the credibility of its programmatic efforts and its personnel.

Implications

Proposition 4 alerts Rxs to the negative consequences that can follow from overcommiting or over-extending themselves, especially during the early phases of their development. It implies that their efforts need to be directed at doing a few things well rather than engaging in a large variety of activities. It also suggests that serious consideration may need to be given to staging or sequencing their several tasks and to engaging initially in a few activities in which the likelihood of success is relatively high. In short, the proposition implies that Rxs need to assess realistically their own capabilities and priorities and be aware of the importance of strategy and timing considerations in planning their programmatic efforts.

Deficiencies in Interorganized Linkage Arrangements

Proposition 5: A circumstance that frequently inhibits the development of productive and harmonious relationships among organizations engaged in cooperative or collaborative ventures is the lack of mechanisms to monitor their activities and to facilitate open and frank communications about substantive issues and procedural matters.

The individuals who developed the initial design of the Rxs did not include their potential clients on the basis of the information available to them, many of them had the strong impression that much of the system was not open to midification. In addition, the infrequent official messages received by agencies engaged in dissemination activities were at times ambiguous. The lack of frequent and open communications has created a serious "insider-outsider" problem. It undoubtedly accounts in part for the antagonistic feelings that have developed among some organizations, particularly the SEAs, toward the Rxs. When Rxs later opened channels of communication, SEAs were frequently unwilling or reluctant to use them.

Impediments to open communications exacerbate the insiders-outsiders problem. Just as the sophisticated linker searches for gate keepers, so also will an Rx attempt to identify gate keeper organizations and individuals to work on important issues of central concern to an Rx. An Rx needs to be alert to ways of minimizing the insider-outsider problem. It needs to give special attention to states not presently involved in the RDx and to agencies not presently involved in the Rx service structure.

Implications

An Rx needs to establish as quickly as possible mechanisms that will permit the organizations they cooperate or collaborate with to obtain the types of information they need to perform their Rx-related responsibilities. Competent individuals need to be placed in charge of these mechanisms so that the messages sent will be clear, candid and unequivocal and so that the receivers develop a positive image of Rx and a feeling that it is "on the ball." It also needs to conduct its relationships with members of its organizational set in a candid and open manner. Such a posture will encourage them to respond in a similar way. Organizations with whom an Rx will work may feel it necessary to hide or cover up "embarrassing facts" that may have an important bearing on their later relationships with it. Stressing the idea that all organizations, including Rxs, are imperfect and rewarding candor generally facilitate open and frank communication.

The Absence or Inadequacy of Groundrules

Proposition 6: The absence of groundrules in collaborative ventures among organizations or lack of clarity about them, if they exist, can serve as a serious impediment to the development of productive interorganizational relationships.

When initial discussions are held about possible collaborative activities between a new organization and existing organizations, the deliberations among their representatives tend to focus on broad issues of general concern to the several parties, for example, the goals of the proposed cooperative venture, its costs and benefits, the overall division of labor among participating organizations, and related matters. Little attention, however, is usually given to establishing the groundrules needed to make a collaborative venture successful or to clarifying those established by funding agencies. Furthermore, when groundrules are established, a number of them may be ambiguous and they may fail to specify how the following kinds of important matters will be resolved. Settling disagreements among organizational members, allocating available resources, determining who has the right to make what decisions, and the obligations and rights of the participating organization. Since groundrules are unavailable or ambiguous, procedures are unavailable to deal with pressing and important interorganizational issues that will probably arise; hence, the absence of groundrules or their ambiguity can serve as impediments to efficient and effective interorganizational relationships.

Implications

It is essential that groundrules be established between an Rx and members of its organizational set prior to their engaging in cooperative or collaborative relationships. If an Rx enters into a sustained relationship with one or more members of its set, groundrules also need to be developed with respect to their working relationships. They should specify the rights, obligations and duties of the participating organizations, and indicate the procedures to be followed in handling disputes and conflicts.

Premature Agreements

Proposition 7: Organizations that are new to a territory frequently enter into agreements with existing organizations before they obtain reliable knowledge about their strengths, weaknesses and capabilities. If it turns out that one or more of these organizations lack the capabilities needed to fulfill its obligations to the new organization then it will be exposed to serious difficulties in accomplishing its objectives.

The views that an Rx initially holds about a member of its organizational set may be inaccurate because the information available to it may be incomplete or erroneous. In addition, its perceptions may reflect the limited positive or negative experiences of its staff members that type of organization, for example, R&D labs or SEAs. If agreements are entered into by an Rx with members of its organizational set that are based on inaccurate assessments of their capabilities then they will probably be unable to fulfill them. Hence, the likelihood is great that proposed collaborative dissemination efforts will fail.

Implications

This proposition implies that Rxs need to be especially cautious about entering into long-term agreements with existing organizations and supporting their long-term proposals when they initiate their regional activities. In addition, it implies that Rxs need to keep constantly in mind that, as noted earlier, agencies such as state departments of education or intermediate units are not interchangeable units. They vary markedly in their organizational capabilities, in their ability to mobilize their own resources for dissemination purposes, in the personnel available to them for this task, and in their quality. In short, an Rx needs to engage in a systematic effort to identify individual differences among members of its organizational set and this information needs to be used in making decisions about allocating its resources and in developing its programmatic activities. Since members of an Rxs organization set can be expected to vary in their capabilities and resources, it will also have to make a fundamental policy decision: should it primarily collaborate with and support existing organizations with a proven record of success or those with no or poor track records in the past but that appear to have real potentialities for providing needed dissemination services for the region.

Management and Leadership Problems

Inept Management and Weak Leadership

Proposition 8: Major contributing factors to the failure of ventures involving interorganizational relationships are frequently their weak or inept management and the lack of leadership exhibited by individuals who manage one or more of the participating organizations.

The activities of the Rxs will involve collaborative relationships with members of its organizational set designed to disseminate high quality R&D services and products, upgrade consumer information about R&D activities, make R&D activities more responsive to school system needs, and in general to upgrade the performance of schools. Each of these tasks is complex and will require planning and programmatic efforts that will encounter numerous barriers when attempts are made to operationalize them. Skillful management and the exercise of considerable leadership will therefore be required if the objectives of Rxs are to be achieved. Furthermore, it can be anticipated that the way those who hold subordinate positions in the Rxs define and perform their roles and relate to the members of its organizational set will be influenced greatly by the attitudes and role performance of their superordinates. Personnel selected to manage new governmental units have on many occasions lacked the requisite commitment, technical competencies, administrative talents, and human relations skills needed to meet the requirements of their demanding roles.

Implications

Proposition 8 implies that a critical factor that will influence the success or failure of programs of the Rxs will be the quality of leadership exhibited by those who manage them. This in turn indicates that a priority task of those responsible for the overall management of the RDx will be to find top-flight personnel with leadership capabilities to fill key management positions in the Rxs.

Poor Planning

Proposition 9: A circumstance associated with many of the impediments earlier considered, and one that has been centrally involved in the wreckage of many collaborative efforts, is poor planning.

The goals of their activities were frequently fuzzy or difficult to operationalize. Their administrators did not specify short-run, intermediate, or long-run targets to be achieved and hence they were unable to design strategies and operational plans to implement them. Their planning efforts typically failed to take into account that the way a proposed program is initially presented to organization members will have a critical bearing on their initial reactions to them and their motivation to implement them. They gave little thought to the implementation obstacles that could be anticipated to arise during different phases of their programmatic efforts and to mechanisms that could be established to identify and overcome them. They showed little awareness that instituting new arrangements or programs of an interorganizational nature is a dynamic and complex process that requires skillful management.

Implications

Proposition 9 implies that Rxs need to make members of their organizational set aware that systematic and careful planning is essential for the development of successful interorganizational programs and they need to demonstrate it's utility for their joint activities. It also implies that the Rxs may need to take a hard look at their own planning efforts, and if necessary, design more efficacious strategies and procedures to achieve their targets. Furthermore, it suggests that if Rxs find that the planning practices of the SEAs or ISAs with respect to their dissemination programs are inefficient or dysfunctional, they may find it efficacious to support in-service training programs that focus on strategies and procedures of planning. The importance of systematic and careful planning for their collaborative endeavors needs to be constently emphasized. Joint planning activities need to be given a high priority on the agenda of meetings between Rxs and members of their organizational sets.

Deficiencies in Personnel Performance

Proposition 10: In establishing new organizations considerable time and effort is usually expended on designing their structural arrangements and preparing job descriptions. Much less attention is devoted to engaging in a careful search for and selecting personnel who possess the capabilities required to fill their roles in a competent manner. In consequence, the role performance of members of the new organization is often deficient when they serve as organizational representative. When this condition exists, it will serve as a major impediment to developing harmonious and effective relationships between a new organization and members of its organizational set.

If serious reservations about the capabilities of the representatives of a new organization are held by members of other organizations as a result of their initial contacts with them, this circumstance can serve as a serious barrier to the development of effective collaborative relationships. In the rush of activities that marks the start of a new organizational venture, staff selection and development usually takes a back seat to the political problems of nurturing and protecting the organization and its nuts and bolts problems. In the case of Rxs, many of their personnel can be expected to be recruited without adequate preparation for their new roles.

Implications

In view of the varied and complex responsibilities of the Rxs, the distrust with which their activities may be perceived by officials of some SEAs and other agencies, and the importance of other organizations to its dissemination and related objectives, a concerted effort needs to be made to procure staff members of top-flight quality who possess excellent technical and human relations skills. In addition to possessing a firm grasp of available knowledge about dissemination, educational change strategies, implementation obstacles, and related areas in both the social sciences and education, they will need to possess skills in interpersonal relations. They will also need to obtain an understanding of the formal and informal social structures of their regions and the organizations with which they will work. If resistance to or distrust of an Rx arises in its region, its staff members will find training in strategies of attitude change of special value.

Absence of Feedback and Monitoring Mechanisms

Proposition 11: Lack of monitoring and feedback procedures will serve as serious obstacles to organizations engaged in cooperative or collaborative activities.

The absence of these mechanisms largely precludes early identification of impediments to productive interorganizational relationships and hence, the ability to determine their causes and to deal with them promptly. Their establishment is essential if a program is to proceed in an orderly manner and with a sense of direction to its objectives. They also serve the important functions of uncovering the stresses, strains, and frustrations of personnel involved in new programs and of underscoring the need for staff sessions to examine ways to cope with its external relations problems. If major impediments to an interorganizational activity are not identified and eliminated, they can readily snowball, get out of hand and lead to its abandonment.

Implications

Proposition 11 implies that Rxs should strongly encourage members of their organizational set to establish monitoring and feedback mechanisms in their cooperative or collaborative ventures since they constitute desiderata for developing effective interorganizational relationships and for the implementation of their plans. Furthermore, in stressing the importance of these mechanisms, the Rx needs to emphasize that they constitute facilitative, not evaluative, procedures. This suggests that the term, formative evaluation, be dropped and that it be replaced by "feedback" and "monitoring" devices.

IV

STRATEGIES AND PROCEDURES TO REDUCE IMPEDIMENTS TO PRODUCTIVE INTERORGANIZATIONAL RELATIONSHIPS

We have considered a number of conditions that could serve as major impediments to the development of productive working relationships among members of an organizational set and have suggested options available to an Rx exposed to them. The obstacles we identified constitute potential barriers that occur with considerable frequency in collaborative ventures among organizations; however, they do not invariably arise. Whether any one of these impediments will arise in a collaborative endeavor of an Rx is problematic. Their occurence will be a function in part of whether the officials who manage an RDx pursue courses of action and institute procedures designed to minimize the likelihood that they will arise. What types of strategies and procedures could an Rx follow that would decrease its chances of encountering serious problems in its interorganizational relationships? What conceptual schemes could guide its efforts? We now offer six observations that bear on these questions.

The first is that an Rx can make a systematic effort to identify the kinds of serious obstacles that are likely to arise during the several phases of its collaborative ventures. One Rx strategy that could be highly functional in this respect would be for its staff collectively to develop an obstacle course flow chart that specified its perceptions of the major difficulties that would arise during its collaborative efforts and its views of their probable causes. This type of planning activity, especially if conducted on a continuing basis, could be valuable for several reasons. First, it identifies potential barriers. Second, it focuses attention on the types of conditions that create them. Third, it leads to deliberations about courses of action that might be pursued to prevent them. Fourth, it alerts staff members to the impact that their own performances have on reducing or increasing the likelihood that potential obstacles will develop into serious impediments. Fifth, viewing potential obstacles along a time line brings out in bold focus how barriers to productive interorganizational relationships may be intertwined. For example, an Rx may anticipate that several key members of its organization set will refuse to become involved in a collaborative activity of special importance to it because of their fears that the Rx will attempt to interfere with their present programs. An analysis of the obstacle course chart may indicate, however, that if these members of the organizational set perceive at earlier stages in their collaborative efforts that Rx officials have no intention of becoming involved in their current activities, their opposition to the new proposal may disappear.

The second observation is based on the idea that the performance of an Rx during the initial phases of its relationships with members of its organizational set will probably have an especially significant impact on the number and types of obstacles that it will encounter later. More specifically, if officials of an Rx do not or cannot clearly specify at the outset of their relationships with members of their organizational set the functions they propose to perform, or if members of the organizational set view their presentation as fuzzy, then these conditions will probably result in serious impediments during subsequent phases of their relationships. Furthermore, if Rx officials in their initial meetings with members of their organizational set equivocate in responding to legitimate questions about fiscal matters and issues related to their division of labor or autonomy, then the seeds will be sown for numerous impediments that can be expected to inhibit the later development of productive interorganizational relationships. If initial meetings called by RDx officials are poorly organized and reflect a cavalier attitude toward planning, then many problems that could have been dealt with effectively and expeditiously at these gatherings can be expected to disrupt later stages of their relationships.

To minimize the likelihood that such dysfunctional developments will occur, Rxs need to devote considerable time and effort to engaging in the homework and planning needed to put their best foot forward in their initial contacts with members of their organizational set. They need to lay the groundwork for reducing or eliminating the noise and other obstacles that can arise in their subsequent relationships. They need to be prepared to answer in a candid and straightforward manner the questions that members of their organizational set have a right to, and can be expected to, raise. They need to propose groundrules that will facilitate the development of effective working relations. Since the quality of the performance of RDx officials during their initial contacts with members of their organizational set will probably constitute a major determinant of the number and severity of problems that they will encounter during subsequent phases of their relationships, they need to be certain that their own house is in order before they engage in transactions with them. In short, administrators of an RDx need to be acutely aware of the impact that their performance in the initial phase of interorganizational activities can have on its later phases and view their performance during this period as a major determinant of the number and type of obstacles they will encounter later.

The third observation about strategies and courses of action that an Rx can employ to minimize the likelihood that serious interorganizational problems will arise deals with the priority that an Rx assigns to this task. We have maintained that the development of effective working relationships with members of its organizational set is an essential prerequisite for the success of an Rx. In operational terms, this means that the duties of one or more staff members should focus on monitoring the external relationships of an Rx, alerting it to actual or potential impediments to its existing or planned programmatic efforts, and proposing strategies to deal with them. An *ad hoc* approach to these tasks is generally of little value. They need to be approached in a systematic and continuing manner and with dynamic and holistic perspectives. If organizational interrelationships are to be monitored effectively, if careful analyses are to be undertaken of the state of existing and potential impediments, and if strategies are to be developed to remive potential barriers, then these important tasks need to be assigned to high level Rx personnel and they should be given the budgetary support required to perform their important responsibilities.

The fourth observation pertains to the value of conceptual schemes in efforts to reduce impediments to collaborative efforts and to strengthen interorganizational relationships. What an Rx requires is a formulation that specifies its objectives and then indicates the stages through which it must move with members of its role set to achieve them. The model developed by Gross and Herriott for the analysis of the dynamics of planned educational change is suggestive in this connection. It assumes that a successful organizational change effort goes through five sequential stages: exploration, strategic planning, initiation of the innovation, implementation and incorporation. It could be argued that successful collaborative efforts between an Rx and its organizational set also requires traversing a similar set of stages. If critical issues that will have a major impact on a collaborative venture are not examined in a hard-headed manner during the exploratory stage, for example, the capabilities of organizational set members to carry out their proposed tasks, then the failure to consider this issue could result in a major impediment to achieving inter-organizational objectives. Similarly, if the strategic planning stage is by-passed, no effort will have been made to identify implementation obstacles and strategies that could be invoked to overcome them. Models of this kind not only indicate the stages of a successful interorganizational effort; in addition, they specify the kinds of impediments that are likely to arise during each of the stages and how they may be related. They also can alert the management of Rxs to pitfalls that they can easily ignore and suggest strategies to avoid or overcome impediments to their targets.

The fifth observation pertains to the importance of an Rx recognizing that the source of certain serious problems it may encounter may be the outmoded or dysfunctional regulations or other types of external constraints to which it is exposed from agencies in Washington, D.C. and in its region. An awareness that the causes of some interorganizational barriers are externally rooted can lead to efforts to remove these external conditions. If successful, they will reduce impediments to productive interorganizational relationships.

The sixth and final observation concerns the posture that an Rx can adopt in dealing with potential or existing barriers to the development of productive relationships with members of its organizational set. On the one hand, it can take a passive or reactive stance to obstacles and attempt to cope with them on an ad hoc basis. On the other, it can adopt a proactive posture to potential sources of stress and conflict in interorganizational relationships. Many obstacles that arise in these relationships are a consequence of misperceptions, misunderstandings, or "noise" in the communications system. Through taking the initiative in identifying potential or actual barriers and exercising leadership in devising ways to avoid them, or to minimize their negative effects, an Rx can materially reduce the number and kinds of impediments to which it will be exposed.

CONCLUDING OBSERVATIONS

In preceding sections of this chapter we have considered a number of problems which an Rx may encounter in its interorganizational relationships. We also proposed courses of action to cope with these impediments and suggested strategies that it might employ to prevent them or reduce their dysfunctional effects. In this concluding section, we identify several strategic ways in which officials who will administer Rxs can exhibit leadership of high quality in managing their complex interorganizational relationships.

One important way that Rx managers can offer leadership to the external affairs is to take the initiative in identifying and dealing with potential or actual interorganizational problems. By adopting a proactive posture, they can prevent some potential obstacles from occuring and minimize the dysfunctional effects of those that do arise. The managers of a new organization are generally so preoccupied with internal start-up issues that they devote little time to anticipating and devising solutions for problems which will probably arise in their relationships with other organizations. In view of their functions Rxs also need to be centrally concerned with their external problems. The skillful management of an Rx requires designing and implementing organizational arrangements that assures that the importance of its external relations is fully recognized. In short, a proactive posture toward the interorganizational problems of an Rx is essential for the exercise of leadership.

A corollary to this observation is that to offer leadership to their organizations, Rx managers need to adopt a prevention orientation to their potential external problems. To implement it effectively will necessitate the formation of both formal and informal sensing and information systems to identify existing or emergent problems, to gain early reactions to Rx proposals or ideas, and to provide information and ideas about alternate courses of action. It also will require the establishment of an Rx mechanism to monitor the "state of affairs" among the organizations in the set. Meetings of formal advisory groups can be of considerable value but they frequently do not yield complete and accurate information. The reactions of a formal advisory group and those of informal groupings or of key individuals in the organizations to important potential problems may be disparate. By the time a problem is raised in a formal advisory group meeting, it may be too late to prevent its occurrence.

A second way that Rx managers can exhibit leadership in managing the external affairs of their organizations is through viewing some of its major problems as opportunities for strengthening its interorganizational relationships. If a manager of an Rx discovers that organizations in the set lack knowledge about conditions that facilitate and block the implementation of R&D products, he could establish a short-term institute that focused on this problem. For example, another opportunity for those who manage Rxs to exercise leadership is to demonstrate that they can offer creative solutions to RDx interface problems. Rx is in a double-interface position between the National Institute of Education on the one hand and SEAs and other organizations in the operating system on the other. Rxs must balance federal requirements and constraints against the service demands of its clients. Serving two "masters" can lead to many role conflict problems, but conflict resolution techniques may be available to resolve some of them.

A third manner in which those who manage Rxs can demonstrate leadership is through utilizing available conceptual schemes that would permit them to examine their organizational problems in a holistic and dynamic way.

The notions that interorganizational relationships can be viewed in development of terms and that internal operations can materially affect an organization's external relations can be extremely heuristic in planning and implementation and program development.

A fourth way that Rx managers can exercise leadership is through conceptualizing an Rx, its relationships, its services, its problems and those of collaborating organizations, in system terms. This orientation focuses attention on interrelationships and interdependencies and on the varied impact that Rx actions may have on other organizations in its set. The systemic characteristics of most organizational sets are presently immature. The form they will take in the future will be dependent in large part on the extent to which their interorganizational relationships evolve in a coherent and organized manner or in an unplanned way. Because of its "global" perspective and its focus on dissemination, an Rx has a unique opportunity to contribute to its organizational set. Whereas SEAs, ISAs, and other organizations must devote their efforts to a variety of educational activities, an Rx can concentrate its resources on system building efforts that maximize the present and potential capabilities of its organizational associates, on improving their conceptual and analytical skills, on clarifying roles, definitions and responsibilities and on identifying gaps and weaknesses in programmatic efforts.

A fifth manner in which Rx managers can exhibit leadership is through both undertaking courses of action that reflect their recognition that they must engage in both organizational and interorganizational development. Since Rxs are parts of labs and centers and thus constitute new units within existing organizations, the extent to which those who manage an Rx engage in activities that are compatible and supportive of other labs and centers activities will impact on the organizational development of the Rx itself. The degree to which the Rxs will influence the operations of the labs and centers, or their programs will be influenced by their host organizations, will be dependent in part on the quality of leadership exhibited by the managers of the Rxs. Rxs can also facilitate the organizational development of its clients' organizations. Since dissemination is a relatively new function for many of the clients of an Rx, it can offer them sorely needed technical assistance. Whether it provides training, dissemination personnel or means to develop resources on a regional basis, the managers of Rxs can or cannot treat these activities as part of systematic efforts to engage in organizational and interorganizational development. If they do, they will be maximizing the resources at their disposal and reaping the cumulative benefits of programmatic and linked activities.

The voluntary nature of the relationships among the organizations in the set will undoubtedly constitute a major impediment to interorganizational development. To the extent that SEAs or other client organizations or groups can refuse to participate in Rx activities, those who manage them will need to exhibit leadership by providing incentives and by finding out basic needs of their potential clients, and by providing services that fulfill them.

Another leadership challenge emerges when an Rx is viewed in short-run and long-term perspective. It normally will have several short-term objectives and is expected to produce services and products in response to identified needs. However, it also is attempting to maximize the dissemination potentialities of its region and this is a long-range process. To integrate the two types of objectives is a critical task confronting the managers of Rxs and will require the exercise of considerable leadership.

If an Rx is to serve as a linking and bridging mechanism among the federal, state and regional levels, it must establish its credibility and trust and the creation of trust and confidence should be a primary leadership task of the Rx manager. He and his staff will need to demonstrate competency, openness, empathy, and the ability to work in a democratic manner with others.

Finally, the exercise of leadership will require that Rx managers possess the ability to design tailor-made Rx services and products for their client organizations. Given the diversity which characterizes the organizations in the set, it is important that each improvement effort be customized to reflect the different needs of clients and the varying contexts in which their needs occur. Such tailoring will place heavy demands on Rx personnel and undoubtedly require them to concentrate on a small number of their critical needs or problems.

Making an Rx operational and offering it leadership are challenging undertakings. The organizational and interorganizational problems that will arise as a result of this organizational innovation will likely be vexing and complex. We hope that the propositions, observations and suggestions presented in this paper will alert Rx managers to potential problems they may encounter, provide them with some general guidelines that they may find useful in coping with them, and stimulate them to exercise leadership in the development of more effective dissemination systems.

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CHAPTER NINE

MONITORING INFORMATION EXCHANGE
WITH IMPLICATIONS FOR
THE RDX SYSTEM

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Northwestern University

The Center for the Interdisciplinary Study
of Science and Technology

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I. OVERVIEW

1. Background

The central notion in the Research and Development Exchange (RDx) is interaction; that is, the voluntary interaction of loosely affiliated organizations with each other, with the educational R&D system, and with the context, or environment within which this system operates. For pragmatic purposes, these participants will be referred to as the:

> contractors - comprised of the four National Service Centers (NSCs) and the Regional Exchanges (Rxs)
>
> core stakeholders - which includes NIE, which is the funding agency and thereby a major interest holder, and the State Educational Agencies (SEAs) affiliated with the Rx in each region
>
> peripheral stakeholders - these are organizations such as the Intermediate Service Agencies (ISAs), Local Educational Agencies (LEAs), ERIC Clearinghouses and commercial producers of educational materials

Each participant associated with RDx performs a wide range of specific activities. The outputs from one activity are often needed as inputs to other activities. These activities are interdependent in that participants could or must interact to perform their own activities. In order to facilitate the performance of activities and the necessary interactions, some form of orchestration is needed.

The goal of orchestration is to provide mechanisms which allow each central RDx participant to integrate its own activities with each other, with those of peripheral participants and with the needs of the educational system at the local level. The National Service Centers and Regional Exchanges will provide a mechanism for such orchestration. NIE's role is primarily in orchestrating the overall interaction within and development of RDx and other general programs within the educational R&D system.

Information about activities is needed as an input to both orchestration and decision-making activities within RDx. Information is also vital to the evaluation of RDx effectiveness and satisfaction of all RDx participants. This suggests the need for including within RDx a monitoring process by which such information can be collected and made available to all participants. In this way RDx can effectively fulfill its dissemination and feedforward functions.

2. The Monitoring Concept and RDx

In general, monitoring is a deliberate, aggressive and ongoing "information capturing" process concerned with the state of internal processes and the external environment of a system or organization. Monitoring is purpose-based. Information on the state of internal activities provides a basis for establishing plans and for coordination, while information about the external environment provides awareness of critical events, factors and changing conditions which may affect the organization.

Monitoring can identify the communication channels which exist or are needed, maintain contacts within the educational R&D system and its context and provide information about RDx to other organizations as a basis for establishing contact. Since RDx is a system characterized by voluntary interactions among loosely affiliated organizations, monitoring becomes an essential process as it facilitates such interaction. In addition to facilitation of interaction, monitoring will provide inputs to individual activities; interaction with the RDx context; inputs for orchestration, evaluation research, organizational learning; and technical information about various educational innovations.

Monitoring is comprised of three basic functions: collection, transmission and linkage. A single organization may collect all of the information needed for its own activities. However, given the complexity of most activities, an organization may lack ability to collect adequate information for its activities (and at times even for a single activity). Therefore, collection in itself becomes a system activity. Once information is collected, it is necessary to transfer the collected information to those who will use it. This requires a link both to feed forward the information needs of the decision maker and to disseminate collected information to the decision maker. Thus, RDx monitoring will contain the collection, linkage and transmission functions, thereby providing a wider range of information to each participant than each could collect on its own.*

Monitoring is analogous to the periodic reading of gauges on dials (i.e., "indicators") which provide descriptive information about some critical aspect or condition of a system or its environment. An individual indicator reflects the state or condition of some aspect of a more complex system or process. Similarly, a set of indicators reflects the overall state or condition of some complex system or process. In order to increase the usefulness of information throughout RDx, consideration must be given to developing comparable indicators and data bases for all participants.

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*Naturally, in designing and operating the monitoring process it is critical to take into account the utilization of monitoring information. This utilization is not, however, a monitoring function per se.

In addition to the collection, linkage and transmission of information, it may be necessary to store both information that has been collected for future use and for future reference information being used in current activities. An organizational memory, which may exist independent of monitoring, includes records of activities, states and conditions of the system at different points in time, as well as qualitative information such as experiences of individuals and analyses based on raw data. The kinds of information required for monitoring and organizational memory, then, may be seen to overlap. Thus, monitoring strongly links into (and can even provide a basis for the establishment and operation of) an organizational memory.

Memory becomes "organizational" only when it can be shared by system members; therefore, memory must be accessible. Accessing involves knowledge of the location of information; thus a "map" of memory is required. The specific storage modes and accessing procedures for the memory should reflect the types of information, the range of members, and the cost/effectiveness. For example, large amounts of future needs data may be stored in computers, microfiche or hard files. Consideration should be given to the number of participants involved and to the cost and effectiveness of each mode considered.

Memory also provides an historical perspective which is essential in determining how to improve or change an organization and in identifying the constraints and conditions to be considered in decisionmaking. By monitoring memory, historical trends can be discerned which may act as a trigger for other monitoring and operational activities. For example, monitored information may indicate the need to modify certain relationships with the environment, or to enter a new stage of development. In turn, this may trigger a search for new indicators to provide a wider variety of information or more detailed information. This is the basis upon which organizational memory becomes an essential input to organizational learning.

Organizational learning denotes the active search for and recognition of factors both internal and external which may affect the system. As RDx is a new system operating in a complex context, organizational learning is critical to RDx. Participants must develop an awareness of how the whole system operates, their roles within RDx and how RDx both affects and is affected by its context.

RDx can learn why some activities were or were not successful and thereby which activities to avoid or repeat in the future. Participants can analyze relevant experiences and share them so that others may learn from their experiences. Since memory will contain descriptive information on the activities of participants, memory information must be made available to participants and participants should place current data, interpretations, and analyses into memory as input for an ongoing organizational learning process. Thus, organizational learning can be an input to RDx decision making, thereby facilitate adaptation within RDx as well as adaptation by RDx to its context.

Further, by identifying the state of RDx development and RDx participants, monitoring will provide a basis for the proactiveness of the National Service Centers. For instance, National Service Centers can know where communication linkages or integration of participant activities are needed. In this manner, monitoring contributes to the orchestration of activities by providing for a consistent level of skill development and awareness among participants.

Monitoring provides input to evaluation of RDx for all participants. For NIE, in this long term orchestration role, monitoring would provide information useful in identifying areas of RDx which require additional support. For an SEA, monitoring would provide information to evaluate the degree to which its affiliation with RDx provides useful information for its own activities. In addition, each participant can use information provided by monitoring to evaluate factors which have contributed to its own successes and failures, and, therefore, as a basis for establishing future interactions within RDx to maintain or improve its own performance.

Since RDx itself is an innovation which is in the process of emerging, it is advantageous to evaluate it in the spirit of a natural quasi-experiment. The monitoring process can provide valuable information on the different activities and approaches used by participants in performing their RDx roles. By comparing these differences and the differential results obtained, RDx can develop valuable insights about what to fine tune and how to direct its internal processes. As the context of RDx changes, and members gain a better understanding of the context, the monitoring process must adapt too. It must be flexible enough to experiment with new indicators and procedures and to modify or discontinue others. Hence, monitoring and other RDx processes and activities should be approached from such an emergent, experimental perspective.

3. General Themes of Monitoring

Some general concerns of monitoring are: hierarchy, control, need for flexibility and need for consistency. We have just noted the need for flexibility.

Consistency is another major concern in monitoring. The RDx monitoring process will provide a wide range of information about a wide range of activities to a wide range of participants. In order for this information to be useful system-wide, participants must be able to understand it. This is to say that the indicators and the information ensuing must be comparable or consistent across all participants.

It should be emphasized that while in one sense there is a natural hierarchy in RDx (i.e., national, regional and state organizations), monitoring in RDx is not hierarchical but multi-directional in nature. An issue related to hierarchy is control. Participants will have some control in monitoring to the extent that their activities are associated with monitoring. As its funding agency, NIE will have a control function over RDx. However, there will be no single, "formal" control over the participants in monitoring. Therefore, the nature of RDx and the orchestration function require different types of information and a different approach to monitoring than would a control system.

4. Two Perspectives on Monitoring

In keeping with the emergent, experimental nature of RDx, two perspectives will be discussed as a base for designing the RDx monitoring process. The ad hoc and formal approaches are presented as polar design perspectives, with a whole range of possibilities in between.

Briefly, an ad hoc approach provides for the use of monitoring only as information becomes needed and would be done only by the participant who needed it. In this sense, each participant would have its own monitoring process, tied loosely if at all to the similarly-specialized monitoring processes of other participants. A formally designed process would call for highly integrated and systematic activities with prespecified and pre-assigned indicators. The information collected would be viewed as part of an integrated RDx wide data base.

In contrast, it becomes clear that each perspective has distinct advantages and disadvantages which must be considered. For instance, the set rules and integrated nature of the formal approach would render the monitoring process slow to grasp changes and even then would require systematic changes in other monitoring activities, whereas the ad hoc approach may provide the flexibility for rapid adaptation. On the other hand, the "every participant for himself" notion of the ad hoc approach may limit interaction -- which is a major purpose of RDx -- while a formal approach does provide for such interaction. Considerations such as the various monitoring purposes, time, RDx participant functions and RDx philosophy must also be recognized. In practice, the conflicting needs for flexibility and division of labor will differ across purposes and shift to some degree during each stage of RDx development. It is likely, then, that some "middle ground" between ad hoc and formal approaches will be needed.

5. The Monitoring Framework

The many aspects and purposes of the RDx monitoring process will make it difficult to design and operate without some prior notion of a structure or framework. Rather than approach monitoring in terms of specific activities, a framework can aggregate the activities by category as well as suggest the range of inputs required in the design decision. A framework is necessary regardless of the design perspective (i.e., ad hoc or formal). In an ad hoc process participants can use the framework as a general guide or starting point. In a formal process, designers may use it to specify how, what and by whom monitoring activities are to be performed. The framework serves to identify major issues and considerations which should be taken into account in making decisions about and within the monitoring process. Specifically, three dimensions are discussed: Types of Information, Time Orientations, and Location of Activities.

In Types of Information, a typology is presented which enables a description of the monitoring process in terms of its principal output (information) and the various components of RDx and its context.

The first class considered is internal unit activities information. The identification and description of each participant's current activities is the focus. By providing information on what activities are being carried out, and how, RDx participants can determine how these activities may affect their own. This information also contributes to RDx orchestration by describing the state of RDx development -- in terms of the activities performed by and state of development of participants. Other classes of information discussed are: External Unit Activities, Internal Unit Results, External Unit Results, and RDx Process information, respectively. Information in any given class is related to that of other classes. These class relationships provide a major basis for locating and relating the diverse activities which comprise RDx monitoring.

Two basic Time Orientations are established. Current Needs information provides inputs to current activities and is hence generally transmitted directly to those participants who need it. Future Needs Information will be relevant only in future RDx activities, including evaluation, policymaking, and organizational learning. Unlike Current Needs Information, it would be placed in memory to be accessed and transmitted to users when needed.

Location of Activities is concerned with identifying which participants will be involved in a given monitoring activity. It is crucial to design location of these activities by specification of where information is to be collected and where that information is needed. This should be based on a determination of the classes of information needed for current and future activities by participants, and the types of information readily available to each.

The final section devoted to the RDx monitoring framework concerns the importance and use of the monitoring "map", presented in Table 1. The map is a blueprint of the system and can be used to direct development of the monitoring process. RDx can be thought of as having four major groups of participants: National Contractors, Regional Exchanges, State Educational Agencies and NIE. The division is based upon the notion that there is far more homogeneity within these groups than across the four groups. This suggests that the need for information within each group is more homogeneous than across the groups. Thus, this grouping provides a useful way to consider the relationships of participants to RDx monitoring in developing a framework.

Any given class of information may include indicators to provide information both for current and future needs. These indicators may be used by organizations in any of the four groups. Each cell of the map represents a set of indicators which are identified in terms of: the class of information, the information needed and the time frame in which the information is to be used. The framework does not describe what each cell will actually contain. Rather, it specifies where specific kinds of information may be collected and where they may be needed.

6. Major Considerations

The above discussion on the monitoring framework provides ways in which to differentiate monitoring activities but does not address how to conduct monitoring and other issues concerning the overall monitoring process. By considering such issues as memory, timing, incentives and metamonitoring, a more dynamic approach to monitoring is unveiled.

Memory

The importance of memory to the monitoring process has been suggested in the overlapping of information needs. The future need information of monitoring is stored in memory. Thus memory must be both available for such use and accessible to participants. Memory will also store historical information and will be monitored for historical trends. Therefore, organizational memory must be developed to facilitate related monitoring needs.

The basic structure of organizational memory is composed of three elements. Storage location is based upon the memory needs of and indicators used by participants. This suggests that memory does not have to reside in one location. It may, in fact, be decentralized. Knowledge of contents in the various locations of RDx memory can be achieved through the establishment of uniform indicators and a "map" of memory. This "map" of memory will be necessary even if it is not decentralized. Accessing procedures and codes should be specified to provide participants with the ability to access memory across locations and to prevent inappropriate use of memory. These three basic structural elements of memory will help to provide an effective RDx monitoring process.

There are three basic types of memory: active, private and secondary. Active memory is open to access by all participants and consists of aggregate data needed for participants activities. Private memory is located in each participant organization and consists of raw data and sensitive information, accessible only by special procedures to guarantee confidentiality. Secondary memory includes outdated data and raw data which has been interpreted or transferred before being stored in active memory. This information is accessible by special permission or procedures at each participant's location. Use of these three "types", in addition to usage of consistent indicators as noted previously, will aid in the input, mapping, and retrieval of information from memory. The emphasis on consistency across participants has been addressed in reference to the monitoring process and is thus being extended to organizational memory.

Timing: When and When not to Monitor

Timing is a major issue in monitoring. Thus, questions of when specific information is needed and under what conditions it should be considered as these affect monitoring. Such factors as cost, overinterpretation, overloads, resentment and inappropriate information will affect timing. Collection of information requires the use of resources such as time and money. If information is collected too often, resources may be wasted and a greater cost is implied. If information is collected too frequently there may be a tendency to overinterpret information by placing inappropriate emphasis on minor changes which may be due to irrelevant events or random errors in the collection itself. Generation of information too often may result in more information than can be processed, analyzed or used by participants and can also overload the communication network. Thus, RDx participants may resent the time and resources devoted to monitoring if it is done more often than necessary.

The issues raised above can be used to suggest several design issues in the timing of monitoring: the frequency of monitoring in terms of how often to monitor a given indicator; the relevance of information, referring to the collection of more kinds of information than required; inefficient or inappropriate use of memory, which can cause some of the problems mentioned; and the staging and phasing of RDx which may require different kinds of information and indicators at different stages. Indicators developed for a specific stage may have to be replaced as the stages change and information relevant only to previous stages may be purged from memory. These five issues should thus be included in the design of monitoring.

Incentives

Since RDx is a voluntary affiliation, strategies should be devised and implemented to help overcome any barriers to and to provide incentives for participation. Disincentives to participation may include: structural and personnel changes which may be required, cost, evaluation apprehension, and vulnerability of sensitive information. For instance, a participant may not have an established organizational memory prior to its association with RDx. The new roles and changes in structure,which development of a memory may entail, can result in resistance to participation in RDx.

Therefore, some specific design issues may be considered The complexity of RDx monitoring (reflected by the number of indicators and amount of shared information for example) will affect cost, changes and thereby use of the system. Thus there is a need to balance complexity and utility in designing the system. RDx may want to support monitoring activities of participants through funds or other resources both to offset resistance due to cost factors and to provide an incentive for participation. Safeguards and specific procedures for confidential information, such as aggregation of data and use of outside consultants. Designers of RDx should be aware that monitoring can affect power balances and participants influence. Participants should be assured of equity both in the exchange of information and distribution of resources. Finally, the issues which have been raised in this section are necessary but not sufficient. This is to say that provision of direct incentives should be considered in the design. A proactive approach to creating such incentives may entail the marketing of monitoring within RDx and the establishment of norms, culture and commitment.

Meta-Monitoring

Implicit in the foregoing discussions is the suggestion that monitoring be monitored. The complexity of the monitoring process and its importance to many RDx purposes (i.e., provision of information to help develop, support and orchestrate RDx) call for a "check" on the monitoring process. The purpose of metamonitoring is to provide this check.

Some criteria by which to evaluate monitoring are thus needed. The four classes of criteria noted below are based on the monitoring framework and the major considerations.

1. Information

Is information collected when it's appropriate as opposed to just for the sake of collecting information? Is information consistent and then, is it being used? Is there redundancy in information, possibly reflecting that linking of participants needs is not occuring or that this may be a fault of transmission (not getting information to those who need it). Perhaps, the information provided is not being used because the time lag between the request for and receipt of information is too great.

2. States of Development

What progress, if any, has been made in participants' capabilities? Are communication channels open RDx-wide? Are indicators being added, refined or dropped when appropriate? The answers to these questions should provide a good view of the state of participation in RDx monitoring.

3. Design Perspective

Is the design perspective which was chosen interfering with the monitoring process? For instance, is an ad hoc system fulfilling participants needs for information or is it producing barriers to the exchange of information? Is a formal system undermining monitoring by its inflexibility? Is a formal system responsive enough to needs? Hence, there will be different criteria necessary depending upon the design perspective chosen. However, regardless of the design perspective, criteria are needed for meta-monitoring.

4. Memory

Is memory being filled with future needs information and historical records of monitoring? Is memory being used by participants? If not or if underutilized, why -- e.g., access problems; linkage problems?

Just as monitoring needs a framework, so too does meta-monitoring. Three basic dimensions of meta-monitoring and then an overall framework are addressed.

A major dimension in meta-monitoring involves: collection, transmission/linkage and memory. Collection is evaluated as to what information is input, and, if it is input at the correct time. Both the linkage and transmission aspects are reviewed in terms of the volume of information in channels, the state of channel development across RDx and the extent to which information is being received by participants who need it. Memory will also be scrutinized in meta-monitoring. Specifically, the focus will be on: whether or not storage of information from the monitoring process is taking place; to what extent, "out-dated" data is being purged from memory (i.e., data which won't be needed in the future); whether or not participants have easy access to stored information.

Another dimension concerns which RDx participants are actually involved in meta-monitoring. Meta-monitoring can be done by any of the four participant groups (that is, NIE, MSCs, Rxs, SEAs). Meta-monitoring activities can be differentiated both in terms of which of these groups participate in meta-monitoring and those aspects of monitoring which they monitor.

A final dimension concerns the differentiation of meta-monitoring activities in terms of which of these groups require meta-monitoring information.

These three dimensions can be used to construct a framework similar to the monitoring framework. Several categories of meta-monitoring activity are provided. Based on these categories, one can establish indicators for meta-monitoring. The four classes of criteria (discussed above) together with the overall framework for monitoring provide an important input to this blueprint as well. By identifying which groups will participate in meta-monitoring and who needs the resultant information, a design for the meta-monitoring process is provided.

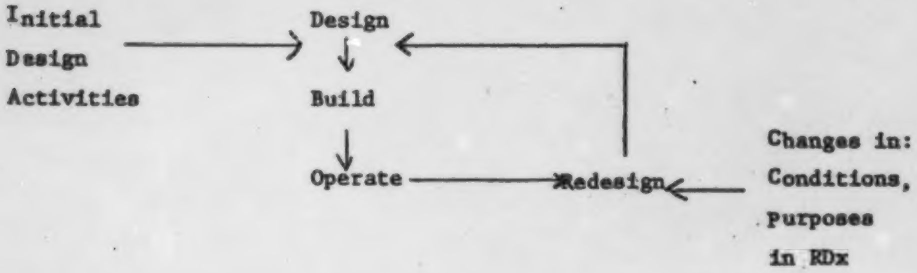
7. Operationalization

The discussion so far has focused on broad conceptual issues. While these are important in providing a basis for addressing, designing and operating RDx monitoring, they must be operationalized into specific indicators, activities, etc.

The operationalization of RDx monitoring is a broad process comprising four major elements.

1. First is the design of the RDx monitoring process. As we have discussed above, this involves the specification and assignment of activities to particular participants, in accordance with some overall approach to monitoring.
2. Another major aspect is the building of the capabilities and mechanisms required (e.g., interorganization mechanisms).
3. The monitoring process must then operate. That is, the actual collection and transmission of information will be conducted.
4. As the process begins to operate, it must be refined, corrected and improved. It must also adapt to changes or increases in its purposes and to changes in the RDx and context themselves. This is referred to as redesign.

The process for designing RDx monitoring is an ongoing process. Afer an initial design, building and operational period, the changes in the development phase become inputs to design. The process repeats cyclically with new designs requiring (perhaps) new building and then new activities in the operation of monitoring, as represented in Figure 2.



In discussing this we will point out decision points and inputs to each step.

Design

The design process is essentially a series of decisions about the configuration of activities and processes in RDx monitoring. This provides a blue print of the monitoring process which specifies where activities are to be conducted and to where information must be transmitted.

The starting point for the design process is the determination of the purposes which will be served by RDx monitoring. We have discussed several of such purposes, and no doubt others exist. RDx must choose from among all possible purposes the ones which monitoring will serve. Initially, this list may be limited. As monitoring emerges others can be added or some deleted on the basis of changing needs and experience.

The RDx must establish the general approach to be taken to monitoring -- i.e., where monitoring will lie along the continuum from ad hoc to formal. Based on this one can make decisions about which participants will, in general terms, be involved in monitoring, where memory is to be located (e.g., the extent to which it will be decentralized or centralized) and so on.

We assume that these decisions will be made based on inputs from, and with the participation of, the various participants in RDx. The choice of purpose and approach must reflect the needs and interests of RDx as a whole. This is important to insure that monitoring will be as useful as possible.

This provides a basis for beginning the initial design of RDx monitoring, and is a critical decision point. Only when purposes and approach have been specifically established and agreed upon can the actual design be attempted. It must be remembered that in a first attempt to establish these things, one need not be overly concerned with final or optimal decisions. One should be as concerned with providing a basis for a minimal monitoring process which, once established and operating, can then be added to, refined, and fully emerge over time.

The process of moving beyond this to an initial design for monitoring is a matter of making specific decisions about what indicators will be used, what procedures will be followed in collection, linking and transmission, and which organizations in RDx will perform these. Who participates in these decisions and the level of RDx in which they are made is a function of the approach taken. In an ad hoc process, they will tend to be made by individuals in each organization, without a great deal of input from other organizations. In a more formal approach, these decisions would be made by individuals from several organizations.

A set of indicators must be established at this point as well. The number and nature of these must be decided on the basis of the purposes served by monitoring.

In the more formal process, one will necessarily have to address the issue of the division of monitoring activities and assignment of indicators across those organizations participating in monitoring, and to identify where the channels over which monitoring information is to be transmitted will be needed.

The next decision point here is whether the design is sufficiently coherent and specific for work to begin on building the monitoring process. Criteria for this decision would include:

1. sufficient detail to allow building
2. simple enough to make initial building comparatively easy
3. flexibility and a sufficient range of procedures to facilitate experimentation and emergence
4. disincentives such as cost, support, and related issues have been considered.

Building

The design provides a blueprint: the identification of which organizations will perform what activities and where information must be transmitted. Based on this blueprint the participants in the RDx monitoring process can develop the capabilities to perform those monitoring activities assigned them. RDx, as a whole, can use this to build the interorganizational capabilities needed for monitoring such as information channels, memory and procedures for exchange of information.

A. Staffing/Training

A major element in building these capabilities is to establish the personnel needs, establish monitoring roles and staff these roles. This must be based on the range of specific skills involved in or related to monitoring. We have identified three basic functions in monitoring (collection, linking, and transmission) and two in memory (storage and access). These provide a basis for establishing the specific skills associated with the monitoring process. By identifying the skills needed in any given organization in RDx, that organization can staff the positions with people who have needed skills and provide training to improve or provide such skills.

The combination of skills needed by any given organization, and the way in which these skills are combined to establish formal organizational roles will be a function of the RDx monitoring design.

B. Channels

Another capability which needs to be built is the ability to effectively transmit information and to identify where it is needed. This requires that communication channels and procedures for their use be established. Linking mechanisms will be needed to direct the flow of information.

C. Incentives

We have pointed out above that incentives are needed to insure that information is collected and transmitted. In building the monitoring process, one must also construct the incentives needed to insure its effective operation. We argue above that several design factors should be considered in the design process. However, one must go beyond this to provide more direct incentives.

These direct incentives involve building a high level of commitment to RDx and a recognition of the need to cooperate (with respect to monitoring) in order to achieve RDx goals as well as the goals of individual organizations. This can be achieved essentially by marketing the monitoring process to RDx members.

In order for monitoring to be effective, there must be a culture established within RDx which facilitates monitoring. This is partially related to incentives. A climate of trust and cooperation must be established. Individuals must internalize norms of exchange of information.

This culture must also include norms of experimentation and "uncertainty seeking." Members of RDx organizations involved in monitoring must feel free to experiment and, more important, recognize the importance of seeking alternative ways of approaching monitoring.

D. Support Services

RDx must also build the support services required to facilitate monitoring. Training facilities can be provided. Resources should be developed to support monitoring (e.g., money, temporary personnel, etc.).

The critical decision point here concerns how far the capabilities have been built. Before the system can be operated one must have established a minimum level of capability. Criteria for this decision would involve the fit between capabilities and activities to be performed in each RDx organization.

Operation

When the capabilities have been established the monitoring process can begin to operate. Information can be collected and transmitted. Several issues are relevant to the operation of RDx-monitoring.

A critical set of issues concerns timing of collection. Several of the considerations raised above are relevant to the operation phase. One should address issues of when and when not to collect information about a given indicator (e.g.: the frequency of collection and relevance of a given indicator at different points in time). One should also address issues concerning the use of communication channels such as the frequency of transmission and form in which information is sent.

Redesign

As the system operates, it will itself be monitored by the meta-monitoring process. This meta-monitoring provides information on which organizational learning regarding monitoring can occur. This learning will concern the effectiveness of monitoring process, e.g.: how various approaches, activities, etc. have worked. It will be based on a comparison of the experiments by various participants, and the "results" of these experiments. This requires that some set of criteria exist, such as those we discussed above (in meta-monitoring section) for evaluating both monitoring as a whole and for individual activities.

Learning based on regular monitoring information as well as the non-monitoring experiences of participants will also occur. Participants will develop an awareness of factors, events and activities in RDx or its context which should be considered in RDx activities. They will become aware of new purposes in addition to those identified in the initial design process which could be served by the information collected in the monitoring process.

In addition, participants will become aware of changes in RDx purposes, in the context and in the role of RDx in the educational R&D system.

All three of these provide crucial inputs to redirecting, extending and refining the monitoring process over time. These inputs provide the basis for the development of monitoring: emergence as a fully articulated and understood process over time.

This learning must be organizational (which here means RDx-wide) to be useful. It is only as the sharing of information and experience and of interpretations that the awareness and understanding of RDx can be translated into systematic changes in RDx monitoring.

Learning based on monitoring information as well as the non-monitoring experiences of participants should also occur. Participants will develop an awareness of factors in RDx or its context which should be considered in RDx activities. They will become aware of new purposes which could make use of monitoring information (in addition to those identified in the initial design process).

Emergence of RDx Monitoring Over Time

The process we have described here should take place as an ongoing cyclical process in which the monitoring process emerges and becomes mature. By developing and redesigning the monitoring process it becomes more sophisticated.

The maturation of the RDx monitoring process should parallel the emergence of RDx itself. Bean and Rogers (1977) have pointed out that the RDx itself will likely go through several stages of maturation. Even in the earliest stage of this maturation there will be a need for the kind of information collected in the monitoring process. Thus, monitoring should be operating (although, perhaps at a rudimentary level) in the earliest stage of RDx. As the RDx matures over time, the monitoring process must mature as well. It must develop according to the changing needs for information within RDx at different stages of maturation as well as in response to the factors discussed in the last section.

II. BACKGROUND

1. Research and Development Exchange

The Research and Development Exchange (RDx) has been conceived of as a means to facilitate the dissemination of educational R&D and to feed forward to the producers of educational R&D the needs and experiences of the users of educational products. In this context, RDx provides a linking function (Bean and Rogers 1977), linking together users and producers (as well as other interested parties) by exchanges of information among several organizations. Thus, the central notion in RDx is interaction.

In the case of RDx, the interaction is the voluntary interaction of loosely affiliated organizations with each other, with the educational R/D&I system, and with the context, or environment, within which this system operates (Mojkowski 1977). The interactions of these organizations involve, primarily, the exchange of information about the state of the art in educational R/D&I, the needs of users, the conditions in the context and so on.

The RDx serves as the major linking role in these interactions. The RDx is essentially comprised of the Regional Exchanges (Rx) and the four National Service Centers. These organizations will be referred to as contractors.

In addition, the RDx has a set of what can be referred to as core stakeholders; i.e., organizations which are actively involved with RDx, which have a major interest in the RDx, and which (it is anticipated) would be represented on Rx advisory or governing boards. This group is made up primarily of (1) those State Educational Agencies (SEA s) which have become affiliated with the Rx in their region and (2) NIE, though there could at times be other organizations included. These organizations and the contractors comprise the central parties to the RDx.

The RDx, operating through these central parties, provides a basis for extending communication linkages to what may be called peripheral stakeholders -- organizations which have an interest in or are of interest for the activities of RDx -- though less directly so than in the case of the central parties. These would include commercial producers of educational materials, educational associations, educational R&D laboratories or centers, universities, the ERIC clearinghouses, Intermediate Service Agencies and Local Educational Agencies (ISAs and LEAs), and other programs for dissemination or feedforward such as the National Diffusion Network or the State Diffusion Grants Program.

2. Special Aspects of RDx Operation

A. Operation of RDx

The organizations which are associated with RDx each perform a range of specific activities which comprise RDx processes. There is a division of labor among these organizations which results in different organizations, or groups of organizations performing different activities.

These activities are highly interdependent. That is, the outputs from one activity are often needed as an input to other activities. These interdependencies within RDx are often quite complex. The outputs from several activities may be required before certain other activities can be performed. In some cases, outputs from one activity may become inputs to another, which in turn produce outcomes needed as inputs to the original activity.

The complexity is increased by the fact that interdependent activities may be performed in different organizations. Thus, interdependencies will exist among organizations, as well as among activities. This requires that the organizations associated with RDx (whether they are core participants, core stakeholders or peripheral stakeholders) must interact to perform their own activities.

B. Orchestration

In order to facilitate the performance of activities and the necessary interactions among organizations associated with RDx, some form of orchestration is needed. By orchestration is meant supporting activities where needed, identifying potential problems or weaknesses in the RDx, and providing a means to strengthen such weaknesses that occur.

The goal of orchestration is to integrate the activities of the central parties to RDx with each other, with those of more peripheral organizations and with the needs of the educational system at the local level. More accurately, it is to provide mechanisms to allow each central RDx organization to integrate its own activities with those of other organizations. In this way, RDx can effectively fulfill its dissemination and feed forward functions.

These orchestration roles are to be formally provided by NIE and the National Service Centers. NIE's role is primarily in orchestrating the overall relationship between RDx and other general programs within the educational R/D&I system. The National Service Centers will be involved in the orchestration of the more specific relationships among organizations associated with RDx, and other organizations in the R/D&I system.

C. Mediation

RDx is in a vulnerable position with respect to the relationships with the core stakeholders. NIE will eventually decide the degree to which RDx will continue to operate. The SEA's will eventually decide the degree to which they will become or remain associated with RDx.

These organizations each have the ability to reduce the effectiveness of the RDx. The contractors must mediate the tensions which can pull the RDx apart. Such tensions can result from the different goals of the organizations associated with the RDx and from different evaluations of the usefulness of RDx for their own specific activities.

D. Need for Information

Each of these aspects of the operation of RDx requires that information be provided which can be used in orchestrating RDx activities, and in evaluating the effectiveness of RDx. It also requires that the contractors have information concerning stakeholder satisfaction with RDx in order to identify where there is a danger of stakeholders disassociating themselves from RDx.

3. Conceptual Overview of Monitoring

In addition to information about the specific characteristics of innovations or user needs, the effective operation of any system requires that information be generated and exchanged concerning the system itself, the activities performed in the system, and its environment. This suggests the need for including within the system a monitoring process by which such information can be collected and made available to decision makers in different locations within the system.

A. Monitoring Defined

In general, monitoring can be understood as the systematic and ongoing collection and transmission of information, useful for operational or policy decision making, which provides a description or overview of conditions, states or activities in the system or its environment.

Monitoring is a general process, characteristic of organizations or systems which must maintain and integrate internal processes and which interact with their environments. Aguilar (1967) has pointed out that effective organizations regularly collect information about their environments in order to provide information about critical events or factors which may affect the organization and to be aware of changing conditions in the environment. Emery (1969) has suggested that a similar process is needed concerning the state of internal activities to provide a basis for establishing plans and for coordination.

Monitoring, then, is a deliberate, agressive and ongoing process for collecting and transmitting information about the state of internal processes and the external environment of some system or organization -- information which is critical for maintenance of the system's (or organization's) operations (Ashby 1960). Hatcher (1976) has characterized this collection of information as "information capturing".

B. Basic Roles in Monitoring.

In addressing the monitoring process it is important to be aware that, in general, information used not be collected by the decision makers who use it. The conduct of monitoring by specific individuals or units in an organization or system makes it possible to specialize the skills needed and to free decision makers from a time consuming activity. In other words, the division of labor between monitoring roles and decision making roles is advantagious. This division of labor suggests that two basic activities must be included in the monitoring process. First, information must be collected. Then it must be transmitted to those decision makers who require it for their own activities.

Since monitoring will produce a wide range of information that serves many different needs, not all information will be useful or relevant to all decision makers. Thus, any given piece of information must be linked with those decision makers who need it. This linking can be thought of as a switch board which identifies where a given piece of information is to be transmitted.

Another consideration here is that information collected through monitoring is not necessarily used immediately. Some information may be needed only in the future for subsequent evaluations or historical overviews of the system or organization. Other information may be needed both in the future and at the time it is collected. This future need for collected information requires that the information be stored in some manner. Those pieces of information to be stored must be identified, linked with and transmitted to someone who will store the information. This storage may be done directly by those people conducting the monitoring process or in some other part of the organization or system (in which case it becomes only a special case of linking and transmission are involved. Naturally, if monitoring information is stored for future uses, it must also be accessed at some time. The access of stored monitoring information is also a basic monitoring activity.

C. Indicators

Monitoring is analogous to the periodic reading of guages or dials (e.g.: a thermometer; an automobile gas guage or an airplane altimeter; a humidity guage) which provide descriptive information about some critical aspect or condition of a system or its environment. The "readings" are indicators — indicators which indirectly reflect some state or condition. An individual indicator reflects the state or condition of an aspect of a more complex system or process. Taken together, a set of indicators reflects the overall state or condition of some complex system or process.

Indicators, then, are specific, identifiable and measurable factors which reflect critical aspects of some process.

It is neither necessary nor efficient to have or use all possible indicators. A wide range of possible information can be provided by indicators which could describe such complex processes or systems. However, not all information of this type is relevant. In some cases, different indicators would provide redundant information (which is notnecessarily a "bad" thing). In other cases, it may not be possible (for whatever reason) to establish an indicator.

The indicators actually used in monitoring are only a limited set of all possible indicators. Thus, it is critical to recognize that the choice of those indicators used in any monitoring process must be based on an understanding, or estimate, of the specific aspects of the phenomena being monitored which are most relevant. This relevance is determined by the decisions to which monitored information will be an input. Other factors such as cost/effectiveness, availability and accessibility will also affect the choice of indicators.

4. Some General Purposes of Monitoring

Monitoring is a purposeful activity. At a general level, we have already noted that the overall purpose of monitoring is to provide decision makers (and analysts) with a background overview of a system or sector. There are some other purposes of monitoring which are worth noting here.

A. Triggering

One major purpose of monitoring is the "triggering" of specific operational activities. For example, the information provided by monitoring can indicate that the system should now initiate a new production process, change the level of its output, modify the nature of its relationships with its environment, modify some internal system activity, enter a new stage of development, and so on.

This triggering may be the result of pre-established thresholds which specify that under a given set of conditions or at a given point in a process certain specified operational activities are performed or new activities are initiated. It may also be the case that a decision maker may find a significant pattern or trend in the information provided by several indicators which indicates that new activities are needed, even though no specific threshold has been established.

This triggering can result in the initiation of additional monitoring activities as well. These may be pre-established. Under a given set of conditions the monitoring process is directed to use other indicators which provide more detailed information about some specific aspect of the system or its environment. On the other hand, the information available may lead to a perception of the need for new monitoring activities. That is, that given the set of conditions which now exist, information is needed for which indicators have not been established, or are not readily available. This will trigger a search for indicators to provide different or more detailed information which can be used as input to a current problem, or to be established as part of an ongoing monitoring process.

B. Memory

A second major purpose of monitoring is to provide a basis for the establishment and operation of an organizational memory.* An organizational memory includes information which has been stored in some form which records past and current activities and the states and conditions of the system at different points in time. In addition, organizational memory includes a great deal of qualitative information: the interpretations and analyses of raw data or of past or current experiences or activities which have been prepared by organizational members, or by individuals from outside of the organization.

A fundamental aspect of memory is the storage of such information. It is important to recognize that a wide range of storage modes are possible. While some information can be stored in the form of computerized records, the more qualitive kinds of information may be more appropriately stored in reports or other documents. Much of this qualitive information will exist in the individual memories of organizational members.

Memory is not simply a matter of the storage of information. There must exist a set of procedures by which information can be accessed. Memory becomes organizational only when it can be shared by organizational members. This requires two basic activities: the locating of where information exists and the transfer of information from that location to another. Different storage modes will require different accessing procedures. Accessing also requires that there exists a "map" of memory: a summary statement of where specific kinds of information is stored, and the procedures by which that information can be accessed. The range of types of information stored in memory and the range of RDx central and peripheral participants require consideration of a wide range of storage modes and accessing procedures. No single storage mode or accessing procedure is likely to be effective and/or cost/effective in all instances.

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*Of course, monitoring is not the only basis for the establishment and operation of organizational memories.

While it is important to note that memory to a large extent involves the storage of information produced by monitoring, and that such information is a critical input to other types of information in memory, the more qualitive information cannot be produced by monitoring alone. Analyses and interpretations, as well as the specific experiences of individuals are critical to the development and use of organizational memory. Organizational memory provides an input to decision making and problem solving within the organization. It makes available information about courses of action which have been taken, the conditions that existed at the time, outcomes of these actions as well as some analyses of why specific results were or were not obtained. As March and Simon (1958) have pointed out information of this type is a major input to human problem solving. Memory also provides a basis for the development of an understanding of the underlying historical processes which have, over time, contributed to the current state of the system. Mouzelis (1967) has argued that such processes are critical in understanding how an organization (or system) currently operates. This historical perspective is essential in determining how to improve or change an organization, and in identifying the constraints and conditions which should be considered in decision making. Thus memory is an essential input to organizational learning which we will discuss below. Finally, it should be pointed out that memory itself is monitored. By monitoring memory, historical trends or patterns can be discerned which can act as a trigger for other monitoring activities.

C. Organizational Learning

Closely related to memory is the process of organizational learning. Duncan and Weiss (in press) have described organizational learning as the process by which members of the organization develop an awareness or understanding of the organization and its environment, including previous organizational activities which have or have not lead to desired results under a given set of conditions. Organizational learning thus limits the "reinvention of the wheel", and by providing an understanding of the nature of the organization's activities, helps decision makers choose those activities or policies which are most likely to lead to success.

A critical factor in organizational learning is that individuals within the system must have access to a broad range of information (both current monitored information and information from memory) which they did not collect and which may well extend beyond their own domain.

5. Purposes of Monitoring in RDx

As discussed above, monitoring is not specific to RDx: it is a process that characterizes organizations and systems in general. In developing a set of ideas about monitoring for the RDx specifically, however, it is important to consider how the general issues concerning monitoring relate to monitoring within RDx and to monitoring issues that arise because of the nature of RD^x itself.

In this section, several specific RDx - related purposes of monitoring are suggested, and the relationship of monitoring to other RDx functions is discussed.

A. Facilitation of Interaction

A central purpose of monitoring is to facilitate the interaction of participating organizations and the exchange of information among these organizations. For example, monitoring can provide information to participants about the activities of other organizations which may be relevant to their own activities. This information can be useful in directing a participant to other organizations with which interaction may be beneficial. Monitoring can also identify the communication channels which exist, or are needed, and which can be used by member organizations. Such facilitation is especially important in systems such as RDx which are characterized by voluntary interactions among loosely affiliated organizations.

B. Inputs to Individual Activities

Monitoring is also important for the individual activities of a participating organization of RDx. It can provide information which triggers specific activities, indicates that certain activities are now appropriate to engage in, that more information about some aspect of RDx or its own organization is needed, etc.

C. Interaction with RDx Context

RDx monitoring provides an important input into maintaining contacts with other organizations in the educational R/D&I system and in the larger educational context. By providing information about the conditions or activities outside of RDx, monitoring helps RDx participants to identify organizations with which more direct interaction will be useful. Such organizations can be important sources of more detailed information about educational innovations or user needs, information which should be included as inputs to the RDx dissemination and feed forward functions. In this way RDx can begin to extend its contacts with its context and expand the range of sources of inputs to RDx activities.

In addition, the process can be reversed. Monitoring can provide information about the RDx to other organizations in the educational R/D&I system and in the larger educational context who have an interest in the RDx. This can provide a basis for such organizations to initiate contact with RDx and to begin to establish linkages between their activities and those of RDx.

D. Orchestration

RDx monitoring provides an important input to the orchestration of the RDx. By providing information to the National Service Centers about the conditions and states of development of RDx, monitoring will be useful in indicating those aspects of the RDx which require additional support. It will also be useful in helping the National Service Centers provide direction to RX and SEAs for building communication linkages among themselves and in integrating their activities.

By providing information on the states, conditions and activities of member organizations, the monitoring process will also provide the National Service Centers with a basis for identifying those participants who might have use for information known to be held by another participant. Thus, the National Service Centers can be more proactive in their service roles, searching out where their services can be useful or where participants may not be aware that their services are available. By doing this, they can contribute to the orchestration of the activities within RDx by providing a more consistent level of the development of skills within the participant organizations and of the awareness by participating organizations of the services available.

RDx monitoring will be a useful input to NIE in its more general, long term orchestration role. Monitoring can serve as a basis for evaluating the effectiveness of RDx and in identifying those areas of RDx which require modification or additional support. Such information will also be useful in making decisions about extending the scope of RDx, and in creating other similar systems for related purposes. The information generated by monitoring can be an input into the design of such systems.

Monitoring provides an important input to orchestration on a more informal level. SEAs, as well as peripheral stakeholders, must make decisions about the degree to which they will interact with RDx organizations, the nature of their interaction and the overall level of their involvement with RDx. Information provided by the monitoring process allows such organizations to establish which other organizations can provide useful inputs to its own activities. Such information also allows each organization to evaluate (over time) the degree to which interactions with specific organizations and the association with RDx in general provide useful inputs to its own activities.

Monitoring also can provide an input to each organization associated with RDx for its evaluations of itself. The organization can use this information to establish the factors which have contributed to its own successes or failures and to provide a basis for establishing future interactions within RDX to maintain or improve its own performance.

RDX monitoring provides a wider range of information to each organization than it could collect on its own. Information becomes available about the activities of the RDX as a whole, about other specific organizations, and about conditions in the educational context. Thus, the increased range of factors about which information is available allows each organization to make more realistic evaluations and decisions.

E. Evaluation Research

A related function of RDX monitoring concerns its use in evaluation research, both on RDX itself and on educational innovations carried out by educational institutions directly or indirectly associated with RDX.

Radnor, Hofler, & Rich (1977) have pointed out that RDx is itself an innovation which is in the process of emerging and that it is advantageous to approach it in the spirit of a natural quasi-experiment. The different parties within RDx are likely to engage in different activities and use different approaches in performing their RDx roles. By comparing these differences, and the differential results obtained, RDx can develop valuable insights in how to direct and fine tune its internal processes. The monitoring process can provide valuable information about the nature of such activities and the conditions under which they lead to different results. Similarly, monitoring as well as other RDx processes and activities should be approached from such an emergent experimental perspective. Similarly, RDx monitoring can provide information important in the evaluation of specific educational innovations; i.e., information about 1) the conditions under which they have been implemented; 2) the results of their use; and 3) the effects of RDx activities (e.g.: need identification) on the success of such innovations.

F. Organizational Learning

Organizational learning is critical for RDx. RDx is a new program operating in a complex context and performing ill-understood activities. Thus, RDx participants must begin to learn how best to operate within the RDx and how RDx operates as a whole.
This requires an understanding of the effects of the complex interaction patterns among the parties in RDx and between RDx and

peripheral stakeholders. RDx members must learn how RDx is affected and constrained by its context and how RDx affects the context. They must begin to develop an awareness of the ways in which RDx can aid their own activities.

This learning requires that information about a wide range of RDx activities, contextual conditions and the state of RDx be available to members of the organizations comprising or associated with RDx. This includes both current information, and historical information from organizational memory. Of course, merely providing such information does not insure that organizational learning takes place, but this is a necessary condition. Monitoring is a major source of such information.

Organizational memory will play a crucial role in organizational learning within the RDx. By providing a record of past activities, the conditions under which they were carried out (both internal and external to RDx) and the results of these activities, individuals in participant organizations can learn from the past experience of others. This is facilitated by including in memory previous interpretations of these data and explanations of outcomes. This process requires that information already in memory be made available to those individuals who need it -- and that they, in turn, place current data, interpretations and analyses into memory, as inputs for an ongoing organizational learning process.

G. Organizational Memory

Memory serves other functions in the RDx as well. It provides a source of technical information about various educational innovations, which can be searched in response to a request for information by an RDx participant or other educational institution. Memory can be used to store information about the activities of RDx participants which is useful in establishing contacts and linkages within the RDx. Finally, memory will provide an historical record of RDx which will be essential in evaluating RDx and making policy decisions regarding its development.

H. Relationship of Monitoring to Other RDx Functions

It is possible that the purposes of monitoring in RDx discussed here will overlap with other RDx functions at certain times. However, it is important to remember that monitoring is concerned only with providing information that provides an overview description of activities, conditions or outcomes, and not with the collection of detailed information about specific cases.

For example, RDx monitoring should be concerned with the need identification process (a central RDx function). Monitoring is not the process by which need identification is done and would not specify how need identification information is to be collected. Rather, the monitoring process would be concerned with certain indicators about need identification; e.g.: when or if need identification was performed, who did it, and certain aspects of the results.

The same holds for other RDx functions, such as information synthesis (cf. Rich, 1977) or information transfer across communication channels (cf. Mojkowski, 1977). Monitoring is concerned with the collection and storage of information to describe such processes and with providing such descriptive information to those who need it -- not with on-line processing of information about specific RDx activities.

6. General Themes and Issues

In approaching monitoring within the context of the RDx, we have focused on several general themes and issues which form the basis for our discussion. These are specifically related to RDx, and extend the discussion of RDx monitoring beyond the purposes of monitoring in RDx discussed above.

A. Monitoring and Control

Many discussions of monitoring are based on the assumption that the information collected will be used for the formal control of those being monitored (cf. Rappoport, 1970). However, since RDx itself has no such direct control function, the nature of RDx and the orchestration function within it require a different approach to monitoring and different types of information than would a control system. (We may note, however, that as the funding agency, NIE does have a control function in relation to RDx. Also, the core stakeholders have a control function via the voluntary nature of their participation).

B. Multi-directional, Non-hierarchical Monitoring

Monitoring processes are generally considered hierarchical in that each level of some system monitors the level below it. (cf. Emery 1969). While there is a natural hierarchy in RDx (made up of NIE and national, regional and state organizations), monitoring in RDx is essentially multi-directional rather than hierarchical in nature. The information needs of RDx require that each participant monitor organizations at each level. It is from such a multi-directional perspective that we will later discuss such questions as which RDx participants monitor different aspects of the RDx and its context.

C. Need for Flexibility

RDx operates in a complex, dynamic environment (or context). Since the range of possible impacts of the context on RDx is so large, it is difficult to specify (without a great deal of uncertainty) what activities will lead to desired results. Burns and Stalker (1961) have argued that organizations operating in such environments require a high degree of flexibility in their internal operations.

This applies to RDx monitoring. As the context of the RDx changes, and as RDx members gain a better understanding of the context, the monitoring process must adapt. Already-established indicators and procedures may have to be modified or even discontinued. New indicators may have to be identified and new procedures for collecting information instituted. Furthermore, the monitoring process itself must experiment with possible new indicators and procedures to provide a basis for learning. All of this requires that RDx monitoring be flexible.

D. Need for Consistency

Monitoring provides a wide range of information about a wide range of activities to a wide range of RDx participants. If this information is to be useful, it must be comparable. That is, the information at a given point in time on a given indicator must be comparable to the information collected on that indicator at different times. Similarly, when several different RDx participants (e.g., several Regional Exchanges) are separately monitoring the same phenomenon, the information they collect must be comparable. This will be an especially important practical issue if the different participants use different indicators. Furthermore, the information must be collected and presented in a way which is understandable to RDx participants in organizations other than the one that collected it.

7. Approaches to a Monitoring Framework

In discussing a conceptual framework for monitoring within the RDx, it is important to consider the range of perspectives that might be used in the design of RDx monitoring and to identify the role of a framework within those perspectives. This section discusses two perspectives and suggests how a conceptual framework for RDx monitoring is related to both. These two perspectives may be seen as two ends of a design continuum, with various combinations of the two perspectives representing a wide range of options available for different purposes and conditions over time. Thus, the conceptual framework suggested here allows experimentation and "emergence" while providing a conceptual design "anchor" or reference point.

A. Two Approaches to Monitoring

The range of approaches to monitoring in the RDx can be seen as a continuum ranging from monitoring as a group of (generally unconnected) ad hoc activities to a formalized, systematic, integrated process. For purposes of analysis, we will here compare these two polar approaches, ad hoc and formal.

Through an ad hoc approach, RDx monitoring would be carried out as information becomes needed and would be done by that participant who needed the information. Each RDx participant would use those indicators which are relevant to that participant's particular needs. Thus, each participant would have its own monitoring process, tied only loosely (if at all) to the similarly-specialized monitoring processes of other organizations. Each organization would have a great deal of discretion in establishing the indicators and the procedures used to collect, store and transmit information in its own monitoring process.

In a formally designed process, RDx monitoring would be carried out in terms of a highly integrated, systematic set of activities. Indicators would be used which are prespecified and specifically assigned to participants. Formal procedures would be established to determine how information is to be collected, stored and transmitted. The formally designed monitoring could be either centralized or decentralized. In either case, relevant linkages would be specified. The information collected would be viewed as becoming part of an integrated RDx-wide data base.

B. Comparison of the Approaches

In considering these two polar approaches, it becomes clear that each has distinct advantages and disadvantages. The ad hoc approach provides for flexibility and adaptation. Monitoring activities can be quickly changed to meet changing needs and conditions. Given the instability and complexity of RDx and the context within which it operates, this could be advantageous. By contrast, the formal approach, with its formal rules and integrated design, would not be capable of rapid change since any change made in monitoring activities would require systematic changes in other monitoring activities.

The ad hoc approach allows for experimenting with new monitoring procedures, thereby facilitating organizational learning with regard to monitoring. An ad hoc monitoring process allows participants to be what Michaels (1973) refers to as "error embracing" --that is, to identify where problems exist and to take action to correct these problems. By providing a formalized set of procedures, the formal approach poses serious constraints to such organizational learning (Duncan and Weiss, in press). However, the formal approach would provide more systematic information about RDx as a whole --

information which can thus provide a basis for more general, RDx-wide organizational learning. While under an ad hoc approach, learning is likely to be more rapid, it would tend to be "parochial" both in content (i.e., limited to local issues and by the capabilities of local personnel) and in scope of use (i.e., by a particular participant except as mechanisms exist for participants to "talk with each other").

The ad hoc approach can also lead to a more efficient use of resources, since time and effort is expended only when information is needed, and only to collect such information as is needed. Under the formal approach, there is a greater likelihood that information will be collected which is not specifically relevant to any given participant or to the RDx at a given point in time.

The formal approach provides for more consistent information over time and across the organizations associated with RDx. Thus with a more systematic monitoring process, a given organization in RDx would be better able to take advantage of information collected by other parties. The ad hoc approach can result in idiosyncratic information which limits the overall usefulness of monitoring. Furthermore, an ad hoc approach may limit the usefulness of organizational memory: information at one point in time may not be comparable to information at another; information collected by one organization may not be comparable with information collected on the same subject by other organizations; indicators and procedures for collection of information will likely vary. In addition, it would be difficult to even be aware of what information is available in an RDx organizational memory since the storage of information would not be systematic.

The ad hoc approach would tend to provide less information which is useful for the orchestration of RDx. For orchestration purposes, monitoring information must be comparable so as to allow comparisons about states of development ; about different participants and their activities; about the need for linkages among participants. An integrated base of information is necessary for the evaluation of the states of development of RDx as a whole, as well, and to determine the overall effectiveness of RDx. Thus, the more formal approach provides a more useful input to the orchestration activities of both the National Service Centers and NIE.

It should also be pointed out that it may not be possible for any given organization involved in RDx to collect, on its own, the information it needs. It is likely that one organization will be required to collect information needed by another. This becomes difficult under a more ad hoc approach. The potential incomparability of information collected across organizations will limit the degree to which this can be done. Furthermore, under an ad hoc approach, it would be difficult to insure that a given organization would have collected information that is needed by or could be used by another organization, especially if they perform different activities. Under a formal approach, this can be provided for by assigning indicators to organizations on the basis of RDx-wide needs, and by establishing procedures for sharing such information.

C. Conclusion

In designing the RDx monitoring process, it will probably be necessary to find a "middle ground" between these two approaches. The designers must make tradeoffs between the advantages and disadvantages of both. The degree to which one approach is given more weight than the other must take into account the conditions which exist in RDx at any given time, the relative importance of the several purposes of RDx monitoring which have been discussed, and the overall philosophy which will direct the design of RDx.

In general, the ad hoc approach should be favored if rapid learning, adaptation, efficiency (in relation to the specific needs of separate organizations) and the decision-making needs of individual participants are more important. It is also preferable if consensus on the information which should be collected by monitoring is difficult to achieve. The ad hoc approach is somewhat more consistent with a view of RDx as an extremely loose, decentralized and voluntary association of organizations; will tend to be consistent with a shorter-term view of RDx (i.e., where RDx is viewed as performing roles to support the immediate needs of its clients); and would probably be easier to develop (and perhaps therefore more viable) in early stages of RDx development.

If such purposes as RDx-wide organizational memory, awareness by participants of RDx as a whole, and provision of consistent RDx-wide information to participants are considered more important, the perspective taken should tend to be more formal. Such an approach would be consistent with a longer-range view of RDx system development and RDx activities, in which RDx provides ongoing support to member organizations and in which the orchestration and integration of RDx activities is of central importantce. This approach is more appropriate when consensus about the role of RDx and the importance of RDx monitoring emerges.

It is important to recognize that these conditions and the relative importance of various purposes of monitoring will change over time. As will be discussed below, a major source of such changes will be the stage of development of the RDx and of the RDx-monitoring process. Another consideration is that the importance of the various purposes of monitoring for a particular RDx activity will vary over time and situation, resulting, to some degree, in a natural fluctuation between the two approaches.

III. A FRAMEWORK FOR RDx MONITORING

In this section we develop a conceptual framework for RDx monitoring. The purpose of this discussion is to provide an understanding of one way to structure the RDx-monitoring process. This structure is, of course, only one aspect of monitoring. As a process, monitoring must also be considered in a dynamic manner. This dynamic aspect is addressed in Section III: Major Considerations.

The framework provides a set of categories, conceptual boxes, which serve as a way to differentiate different aspects of Rdx monitoring. The framework provides a structure for making decisions of this type by suggesting the range of inputs required for the decisions; by identifying the kinds of design and operating decisions which must be made; by suggesting possible ways to approach the identification of alternatives from among which to choose in the decision process; and by identifying and distinguishing among the various activities and processes which comprise the overall monitoring process in terms of categories into which they can be sorted. The framework also provides a way to consider the interrelationships among specific activities and processes by identifying the relationship among the categories in which they are found.

In this way. the framework serves to identify major issues and considerations which should be taken into account in making decisons about and within the monitoring proeess. The framework can be used regardless of the approach taken to monitoring: that is, whether it will be more an ad hoc or a formal process. While the location of, and constraints on, decision making concerning monitoring will vary depending on the approach taken, the kinds of decisions will remain essentially the same.

The framework discussed here is relevant regardless of the perspective taken in designing RDx monitoring. It is our position that a framework is needed for an ad hoc monitoring process as well as for a formal one. The framework provides a mechanism to establish monitoring activities. Under an ad hoc approach, this framework serves as a general guide which provides any given participant with a starting point from which to develop its own monitoring processes, and raises issues which could be critical in conducting monitoring activities. The framework provides a way of thinking about these issues, and considering the interrelationships among them , in terms of how they might have an impact on monitoring activities. In addition, it provides the individual organization with a set of suggestions concerning how to conduct monitoring activities in such a way that information is collected which will be useful to both of them and to RDx.

The degree to which a more formal approach is taken towards RDx monitoring would be reflected in the degree to which various aspects of the framework are used to formally specify what monitoring activities a given participant will perform and how they will be conducted. In a highly formal approach, the full framework can be used to provide the basis for a formal set of formal procedures for RDx-wide monitoring and a map of those procedures to facilitate the operation of the monitoring process.

Thus, the relationship of the monitoring approach taken by RDx to the framework is one of the degree to which the framework is used to provide a formal monitoring process. The decision on what approach is taken is a design issue which cannot be made within the context of this report.

1. Classes of Information

The range of purposes served by RDx monitoring require that several types of information be collected by the monitoring process.

A typology of the information with which monitoring is concerned provides a useful starting point in developing a conceptual framework for monitoring.

Such a typology is also useful in designing a monitoring process since it provides a way to classify monitoring activities by the type of information collected. Thus, one can begin to see how the monitoring process is structured in terms of the underlying relationships among the classes of information produced by monitoring. This will make it possible to describe the overall monitoring process and how it is conducted in terms of the principle output: information.

The typology discussed here is based on the different aspects of RDx and its context which are monitored. This links the classes of information collected to the specific foci of monitoring. This allows one to approach the overall monitoring process in a way which makes it possible to specify and understand where monitoring activities should be directed. It thus provides a first step in developing an overall conceptual map of the monitoring process.

Other approaches to a typology are, of course, possible. For example, one could classify information in terms of the specific purposes to which it is put. However, other approaches do not provide a mechanism which is as useful in describing and understanding the overall monitoring process.

The monitoring process provides information about the states, conditions and activities within RDx and in the educational R/D&I context which is needed by RDx participants and stakeholders as an input to their own activities. This information can be divided into five classes of information about activities internal and external to RDx.

A. Internal Unit Activities Information

This class of information concerns specific RDx activities performed by RDx members. It is unit-specific in that the focus of such information is the identification and description of the activities that each participant is currently engaged in. Such activities would include need identifications, preparation of information synthesis, or various service functions.

This class of information focuses on what activities are being carried out by particular participants, how they are being done, the time taken by the activity and the inputs used for it. Such information is often needed by other organizations as an input to their own activities.

This class of information is an important input to the orchestration of RDx. It can describe some aspects of the state of development of RDx as a whole in terms of the range of activities being performed, as well as the state of development of the individual participants. Thus, it provides a basis for allocating and channeling resources to those participants. Such information is an important input to organizational learning, as well. By providing information on what activities are being carried out, and how, RDx participants can determine how these various activities affect their own.

B. External Unit Activities Information

A second focus of RDx monitoring concerns the specific activities being performed by organizations in the educational R/D&I context, such as universities, educational labs, and local educational agencies.The concern here is the same as with internal unit activities: identifying and describing the activities these organizations are performing.

This class of information is important to establishing linkages with the RDx context. It provides an input for determining how RDx affects and is affected by activities performed in its context. Such information is also an important input to decision making within the RDx (and to specific RDx activities) in that it identifies sources of education R&D output which can be added to the material disseminated by the RDx. It also identifies organizations to whom user needs can be fed forward, and with whom users can establish linkages. Other potentially relevent context information would include: other dissemination/feedforward programs or institutions; political dynamics which impact RDx or educational R&D; etc.

C. Internal Unit Results Information

This class of information concerns the identification and description of the results or outcomes of the specific activities of RDx participants. It is important to bear in mind that this does not include the full range of information produced by such activities as need identification or knowledge synthesis. Rather, it is a summary description of such results and is based on particular indicators such as the types of need identified in a particular case, the use to which a need identification was put or the number of sources used in a synthesis. This class of information would include, as well, such things as the results of a training program run by the National Service Centers, the action taken on a specific request for assistance by an SEA or LEA, and so on.

This information is important for the evaluation and orchestration of RDx in that it provides an input to determining the impact of RDx outputs. It can also be important in providing input to the decisions and activities of other RDx participants which have a need to know the status of certain aspects of the RDx.

D. External Unit Results Information

This class of information concerns the outcomes from activities or processes taking place in organizations outside RDx, but relevant to it. It would include the results of particular R&D projects, the effects of a particular innovation in a specific school, the results of policy studies carried out on the educational system and the like.

As in the other classes of information, monitoring is only concerned with specific indicators to describe such results. Monitoring does not provide the means by which the detailed information about such results is brought into the RDx. Monitoring will only identify the fact that such information is available. Obtaining more detailed information can be done as needed by decision makers.

This class of information is of particular importance in establishing targets for linking RDx with the educational R/D&I system and with the larger educational context. It identifies where information exchanges will be most fruitful, and which particular RDx participants should be involved in linking with particular organizations external to RDx. It also provides information on conditions in the educational R&D system and the context within which RDx operates which may constrain or help RDx activities. Thus it is an important input to RDx decision making.

Such information provides a basis for developing understandings about how RDx activities have affected results in its context and how results in the context affect RDx results and activities. Thus, it is important both to the evaluation of RDx by NIE, and for organizational learning within the RDx.

E. RDx Process Information

The final class of information concerns the description of the interorganizational relationships which comprise RDx system processes. This information would include the state of the development of communication channels among participants and stakeholders (cf. Bean and Rogers 1977), the levels and types of communication within those channels that exist, and such things as interorganizational conflict and consensus (cf. Mojkowski 1977).

This class of information would also include the channels of communication and nature of the relationships between RDx organizations and organizations in the educational R&D system.

This information is useful as an input to evaluating the development of the RDx. Indicators concerning the current levels of interaction among participants and where this interaction is taking place can be used to determine where further development of RDx is needed. Such information can also be used to determine the effects of different kinds and levels of organizational interaction on the results of specific RDx activities. Thus, it becomes an important input to organizational learning.

F. Relationships Among the Classes of Information

The five classes of information presented here represent a conceptual break-down of the different foci of the monitoring process. Such a break-down is useful in locating where specific monitoring activities should be directed. In other words,given some specific purpose of monitoring (e.g. orchestration) the typology provides a framework in which to consider what types of information are necessary inputs to that purpose. Having identified the required types of information, one can then establish specific monitoring activities to collect it.

It is clear in the discussions of each class that information from different classes may be needed for any given purpose. Each class of information, while it provides a distinct input to some purpose must be considered as part of an information "package" which is sought for any given purpose.

2. Time Orientations

A major distinction can be made in monitoring on the basis of the time orientations which underly the intended use of the information collected. As we pointed out above, at any point in time monitoring may provide information which is to be used as inputs to current RDx activities or decisionmaking, or to be placed in organizational memory for use in future activities or decisionmaking. This distinction allows one to identify two types of information, and in turn, differentiate the monitoring activities which produce this information.

A. Types of Information

a. Current Needs Information

In the monitoring process one can identify those indicators which provide informational inputs to current, operational activities. These indicators may be from any of the five classes of information discussed above. The current needs information would generally be transmitted directly to those individuals or organizations which require it.

b. Future Needs Information

Some subset of the indicators in each of the five classes of information will be relevant only in future RDx activities. Information not needed in current activities may be critical in establishing trends or patterns over time, or to provide background data for such activities as evaluation, policy-making or organizational learning.

Information of this kind would not be directly transmitted decision makers. Rather it would be placed in organizational memory to be accessed and transmitted to users when needed.

B. Relationship between Current and Future Needs Information

The critical distinction between these two types of information lies in the purpose for collecting a given piece of information. This distinction provides a way to recognize that indicators of both kinds are needed. Thus, it can be useful in identifying the specific indicators needed, and of further sorting the indicators used in monitoring in terms of their purpose.

The distinction made does not directly affect the actual collection of information. It is important, however, in providing an input to the linking function in monitoring. Under those conditions when information must be transmitted to decision makers or to organizational memory for storage that is crucial to know.

In making this distinction, one should bear in mind that some indicators may be included in both categories. Some current needs information may also be relevant for future needs. This overlap between the categories makes the distinction more important. It allows one to recognize that one may have to transmit a given piece of information to a number of different locations so that it can be used in a number of ways.

3. Location of Monitoring Activities

Another aspect of describing the structure of monitoring activities concerns who in RDx is to collect information on a given indicator. Locating responsibility for monitoring activities within the RDx is a major design issue. The discussion here extends the framework in a manner which provides a basis for considering this design issue.

A. Location by Groups of Participants

RDx can be thought of as having four major groups of participants: National Contractors, Regional Exchanges, State Educational Agencies and NIE. While these are not purely homogeneous groups, there is far more homogeneity of role within these groups with respect to RDx than across these groups.

This suggests that the need for information within each group is more homogeneous than across groups. Therefore, these four groups can be used as categories for describing the overall monitoring process and for approaching design decisions about where to locate specific monitoring activities.

B. Linkage and Transmission among Groups

It is crucial to approach locating of the monitoring activities in terms of specifying where information is to be collected and where that information is needed. This must be based on a determination of the classes of information needed for current and future activities by organizations in each group.

As we have argued, it is important to recognize that monitoring involves not only the collection of information, but also its transmission to those decision makers who need the information, and the linkages which direct the transmission and which serve to feed forward the needs of decision makers for specific kinds of information. Thus, it is essential that the monitoring process be understood in terms of the linkage and transmission relationships among the four groups of participants. The monitoring framework, by including these groups, can be used to identify general needs for information and to identify where that information is collected. The linking function, in both directions, can thus be based on the framework.

This provides eight categories of information. The specific indicators collected by the organizations in each of the four groups, and the indicators about which they need information. It need not be the case, as we have argued above, that a given organization will collect all of the information it needs. It should also be pointed out that there is no reason to assume that a given organization will itself use or need all of the information it collects. The complexity of RDx is such that an organization in one group may have access to information (i.e., be able to monitor a given indicator) which is needed by another organization which cannot monitor it itself. In a purely ad hoc approach to monitoring, it would be the case that each group collects the information it needs. This may result in some problems if a given group cannot get access to indicators which it needs. However, this may be traded off against the lower costs, no need for transmission, and ease of acceptance of an ad hoc approach in the design of RDx.

At the other extreme, the purely formal approach would view these two dimensions as independent. The decision of who is to collect information would be based on what is needed by all RDx participants. Each group would be formally assigned a set of indicators on the basis of what it could collect most easily and inexpensively. The problem of linking and transmitting this information to where it is needed would be considered separately.

In trading off between these polar perspectives one can limit the degree to which organizations collect information needed by others. This limits the amount of transmission required and begins to supply the overall monitoring process.

Thus, the information collected by each RDx group must be understood as being interrelated across groups. Any given indicator used by one of these groups may be part of an information package needed for a given purpose which includes information collected by organizations of another group.

4. Overall Framework

We have noted three dimensions for differentiating among monitoring activities: classes of information; current and future needs for information; and four basic RDx groups. These three dimensions can be combined to provide an overall framework for RDx monitoring. This allows one to identify specific categories of monitoring activities in terms of the combinations of the three dimensions. This makes it possible to fully describe the structure of monitoring within RDx and to identify the relationships among these more specific categories.

A. Categories of Monitoring

As we suggested in the discussion of each aspect of the framework, the three dimensions defined overlap each other. Any given class of information may include indicators to provide information both for current and future needs. These indicators may be collected by organizations in any of the four groups. These three dimensions are fully matrixed -- any combination of the categories in each dimension is possible. This is represented in matrix form in Table 1.

Each cell of this matrix represents a set of indicators. The indicators would be identified in terms of the class of information they represent, who collects this information, and the time frame in which the information is to be used. Additionally, the specific information needed would, of course, be specified.

This framework helps to identify the possibilities of monitoring. It does not identify, of course, what will be monitored, when, or by whom -- these are design issues to be decided by RDx.

B. Interrelationship Among the Framework Dimensions

The full utility of the framework can only be realized when the categories it provides are understood to be related. In the discussions above we have pointed out that the more general categories in each dimension are related. It is also the case that there exists a relationship among the dimensions which can be used to specify the relationships among the more specific categories in the full framework. Any particular monitoring purpose may require information from a number of categories in or across the three basic dimensions of the full framework.

Figure 1

FRAMEWORK FOR RDx MONITORING

	NEEDED BY								COLLECTED BY							
Information Concerning	NIE		SEA		NC		RX		NIE		SEA		NC		RX	
	FN	CN	FN	CN	FN	CN	FN	CN	FN	CN	FN	CN	FN	CN	FN	C
Internal Unit Activities																
External Unit Activities																
Internal Unit Results																
External Unit Results																
RDx Processes																

The categories are also related by the ties between where information is needed and where that information is collected. The complexity of this relationship will vary with regard to the design of the monitoring process. On the one hand, each organization would collect only that information which it needs. On the other hand, the relationship between need and collection becomes complex to the extent that organizations collect information of a specific type which is needed by other organizations (and vice versa).

The categories are also related in terms of the relationships among the specific indicators in each category. A given indicator may be included in more than one category. By identifying the categories in which an indicator is included, one can establish a basic relationship among them. Several other relationships of this type exist. Indicators are related when they provide the same class of information. Indicators are also related if they provide information for the same purpose or for related purposes. The relationships among indicators, then, reflect the relationship among classes of information. Such relationships provide a way to limit the number of indicators needed for the monitoring process. Any given indicator can be examined in the light of its relationship to other indicators, to determine if it is necessary or if it only provides information available from other indicators.

Some redundancy, of course, is useful in providing a means of checking the accuracy of information. By comparing highly related indicators one can determine if they are providing the same information. If not, there may be serious accuracy problems.

This is more fully discussed below under Meta-Monitoring.

It is also important to understand the relationships among indicators when the information they provide is for more than one purpose. In such cases inaccuracies in the information will undermine several activities. While any inaccuracy is to be avoided, in such cases the problems are more serious.

A final point about the relationships among indicators is that it provides a basis for thinking about the indicators used in the overall monitoring process. By understanding the relationships among indicators one can determine the utility of information collected by other parties in RDx for one's own activities. If some other party has information on a set of indicators related to those one is collecting, the information collected on these indicators can be a useful additional input to one's own information.

C. Applications of the Framework

We have said that the basic framework provided here is a useful input to open the design and operation of the monitoring process. This section discusses both of these applications of the framework.

Design of Monitoring

The process of designing the RDx monitoring process can be thought of as essentially specifying the indicators which are included in each category. This requires that there be some initial specification of the purposes of monitoring, such as those we have suggested above. This provides the basis for establishing the full range of information needed by the monitoring process.

The framework provides a way to characterize the information needs in terms of the classes of information, and its use in current and/or future decisions. The framework can aid in directing attention to the possible kinds of information which might be useful for any given purpose. In other words, it asks if information of a given class is needed for a given purpose, and if a given purpose requires that information be placed in memory for future use.

The framework also provides a basis for identifying by whom a given indicator is to be monitored. There are several possible ways to do this. All monitoring may be done by organizations in a single group. It may be the case that each group collects information only in terms of its own needs. Finally, it is possible to design monitoring in such a way that each group of organizations collects information (on a given set of indicators) which is needed by organizations in other groups.

These decisions can be facilitated in terms of identifying by whom information is needed. This must be based on the RDx activities performed by organizations in each group, and the purposes of monitoring associated with these activities. The framework provides a way to break these down and identify the extent to which there is overlap in information needs, and the indicators associated with overlapping needs. This can be used to determine which strategy for designing monitoring is most appropriate.

Ultimately, the framework can be used to provide a detailed blueprint or map of the design of the monitoring process from which the monitoring process can actually be constructed. It can specify the locations in RDx where the capability to monitor must be developed, the actual indicators which must be established and so on. We discuss this in more detail below.

Operation of Monitoring

The overall framework is an important input to the effective operation of the monitoring process. We have suggested above that monitoring involves three basic functions: collection, linking and transmission. The framework is directly related to each of these. As we have already described in the previous discussion, the design will specify who in RDx will collect information. The latter two functions require this information as well as as the full monitoring framework.

By specifying where information is collected and where it is needed, the map of monitoring provides a basis for establishing to whom the information collected in a given organization must be transmitted. Thus it provides a crucial input to participating organizations in developing communication channels with other organizations. The map of monitoring identifies where such channels are needed for transmitting monitoring information and for feeding forward to those organizations collecting the information needs for information of those organizations who need it.

The map also provides an input to the linking function.

When a given piece of information is collected by an organization, the map can be used to determine the organizations to which that particular piece of information is to be sent. It need not be the case that all information collected by a given organization is transmitted to other organizations. Further, information that is sent to some is different than that sent to others. Thus, the map can be used to prevent overloading channels with unneeded information.

IV. MAJOR CONSIDERATIONS

The framework discussed in the previous section has treated the structure of the monitoring process. This treatment has been static — focusing on the basic elements which comprise monitoring in RDx. However, monitoring is a dynamic process which must be understood as taking place over time and as being comprised of the interactions among many individuals and organizations. In this section we will address several issues which arise from the dynamic character of RDx monitoring.

1. Inter- and Intra-Organizational Relations in RDx Monitoring

No matter how it is designed, the RDx monitoring process will entail interorganizational and interunit interaction. Monitoring activities may be distributed across several organizations in the RDx, and across several units in any given organization. Even if a single central monitoring unit is established, the use of monitoring information will require that information be transmitted to various decision makers in RDx.

The inter- and intra-organizational interactions raise a number of coordination and conflict issues. In general, these issues apply at both the inter- and intra-organizational levels.

A. Differing Information Needs

One issue is that different decision makers will have differing information needs. Thus, the design of monitoring and subsequent monitoring activities must be coordinated with these differential information needs. Further, since we can assume that resources are limited, not all of the information needed by all decision makers can be collected in the monitoring process. This poses a potential source of conflict within RDx. If RDx monitoring is conducted by each organization for its own needs on an ad hoc or decentralized basis, these problems will tend to exist on an intra-organizational basis. The problems are compounded at the inter-organizational level. The problem becomes greater when these different information needs are to be considered on an RDx wide basis.

B. Information Flows

A second major interorganizational issue for RDx monitoring arises out of information flow processes -- both to those who monitor and those who use monitoring information. These flows of information must also be coordinated to insure that information reaches the appropriate people when needed in useful forms.

The failure of smooth information flows can cause conflicts over the operation and value of RDx monitoring. For example, the failure of information to reach the decision makers when needed and in useful form can result in poor decisions and, therefore, in resentment toward the monitoring process. The inability of decision makers to influence the sorts of indicators being monitored and monitoring personnel can cause low levels of support for monitoring information.

While internal communications might appear to be less problematic, Guetzkow (1963) has discussed several threats to the intra-organizational flow and understanding of information.

C. Unequal Development

The various organizations that comprise RDx may, at any given point in time, be at different stages of development and thus tend to have different monitoring needs and capabilities. This can be true even among organizations of the same type (e.g.: among RXs; among SEAs). Thus, the operation of monitoring must be coordinated with these different stages of development in order to provide the maximal usefulness to different organizations. Otherwise, RDx monitoring can end up serving the needs of only a few organizations. This can result in resentment and eventual failure to use the monitoring process by the decision makers in these organizations. It can also lead to interorganizational conflicts.

D. Need for Orchestration

The above issues suggest that as the RDx monitoring process operates, there will be a need to orchestrate the various monitoring activities with respect to each other and with respect to other RDx activities. In formal organizations, such orchestration is often achieved through a hierarchy of authority and organizational structure (Emery, 1969). While such organizational techniques may be used within the organizations related to RDx, the nature of RDx is such that such direct attempts to orchestrate may be viewed as attemtps to control the participant organizations. This would be inconsistant with the voluntary nature of RDx and could easily lead to low participation in RDx and low levels of support for the RDx system.

2. When and When Not to Monitor

In viewing monitoring as an ongoing process one begins to see that it is based on the collection of information on specific indicators over time. It is important to recognize that in monitoring one does not continually collect and transmit information on all indicators simultaneously. In this section we address some general issues concerning the timing of monitoring activities and suggest some basic dimensions which can be used to design the monitoring process with respect to timing. By timing we mean simply when a particular indicator is or is not collected or transmitted.

A. General Issues of Timing

The question of when and when not to conduct monitoring activities can be discussed in terms of several basic issues which are related to the timing of monitoring activities. These issues must be taken into account in any design of the monitoring process.

a. Cost

The collection and transmission of a given piece of information requires the expenditure of resources such as time, money and personnel. Clearly the more information that is collected and/or transmitted, the greater the amount of resources that will be required to conduct monitoring. Thus, decisions about how often to collect or transmit information may at times be at least partly determined by cost considerations.

b. Need and Use

The issue here is simply that it is wasteful of resources to collect and transmit information that is not needed or (for whatever reason) cannot be used. Here, however, consideration must be given to information needs and usefulness in the long term as well as in the short term.

c. Overloads

The people who collect, transmit and use monitoring information can become overloaded if attempts are made to collect and transmit more information than the "system can bear". The sheer volume of information can become so great as to exceed the ability of people to store, process, analyze and interpret it, thus rendering it useless and leading to confusion.

d. Overinterpretations

When faced with great volumes of information, individuals may have a tendency to place inappropriate emphasis on minor or random changes that occur in this information. Indeed, by providing more information than necessary people may 'discover' misleading patterns, and come to erroneous conclusions about what is going on.

e. Inappropriate Information

At any point in time, information on a given indicator may be irrelevant or misleading. Some indicators will be useful or meaningful only at certain stages of a given RDx process. Indeed, some will be useful only at certain stages of the emergence and development of RDx itself. Furthermore, different information will be collected for different purposes, such as formative vs. summative evaluation. Providing inappropriate information not only wastes resources, but can lead to making decisions based on misleading factors.

B. Dimensions of Timing

In designing the monitoring process, the above issues can be taken into account in terms of two basic dimensions.

a. Frequency

The more frequently monitoring information for any given indicator is collected and transmitted, the greater the likelihood of problems of the kinds discussed above. Thus, indicators should be monitored only with sufficient frequency to insure that changes in conditions, etc. are picked up.

This will require some learning, of course, and tradeoffs may at times have to be made when the needed frequency of collection (and transmission) could lead to the problems noted earlier. Naturally, some indicators will require more frequent monitoring than others, and some information will need to be transmitted more frequently than other information.

b. Relevance

These problems can be lessened by collecting only information that is needed either currently or for future activities. Here, two observations are in order. First, relevance will vary over time. Some information will be relevant only at specific points in time and if collected at other times can be inappropriate, misleading and a waste of resources. Second, over time some indicators will cease to be relevant at all. For example, some indicators will only be useful in the early stage of the emergence of RDx. When these indicators are no longer needed, they should be dropped from the monitoring process.

3. Monitoring and Memory

The operation of monitoring has within it a large component which involves the interaction of the monitoring process with organizational memories. We can not here discuss in detail the structure or operation of organizational memory within RDx itself, or in its constituent organizations. However, we can raise some issues about the nature of organizational memory and the ways in which monitoring and organizational memory interact.

A. Nature of Organizational Memory

Organizational memory refers to that information, knowledge and experience that an organization stores in some form for future reference and use. Organizational memory can use various storage modes. Perhaps the most familiar is some form of computerized data bank and information retrieval system. However, it is important to bear in mind that organizational memory has existed for far longer than computers. Filing systems in which records, reports, papers and other documents are stored, are a major form of organizational memory. In fact, the memories of individual members of an organization may be part of an organizational memory.

Critical to an organizational memory is the ability of members of the organization to access what is stored. Thus, members of the organization must know of the existence of organizational memory and have some idea of what kinds of information exist in it. There must be some mechanism by which information, knowledge or experiences can be stored. There must also be some which permits members to access this information in some form.

Within RDx, one must recognize that each associated organization will have some form of organizational memory, although it may be informal and not well defined. These memories will exist independently of any RDx wide memory. We refer to these as private memories: those organizational memories which are accessable only by members of the specific organization and into which information can be stored only by these members. Thus, these private memories may include sensitive information or information that is not for exchange with other organizations associated with RDx.

On the other hand, it will be crucial that RDx itself have an RDx-wide memory that is accessable by members of the organizations associated with RDx. As Rich (1977) points out, there is a need for the various organizations associated with RDx to have access to the experiences of other such organizations, and to

know what they have done in various situations in the past, and what the results have been. An RDx-wide memory would also have information about the educational R/D&I context.
This RDx-wide memory could be constructed centrally in one of the National Contractor organizations. This would then require a set of communication channels between the other organizations and the central memory. These channels would permit each organization to access memory and to store information in memory (e.g., future needs information).

On the other hand, the RDx-wide memory could be constructed so as to be distributed over all organizations associated with RDx. Each organization would store in its own memory such things as may be needed by other RDx organizations. In this case each organization would have a part of its memory which is private and part which is RDx. This RDx part would be accessable to other organizations associated with RDx.

In constructing RDx-memory either strategy could be used; each has advantages and disadvantages. It is beyond the scope of this discussion to address these. For our purposes it is only important to note that an RDx-wide memory should exist and that it may exist in some mix of these two forms.

B. Interaction of Memory and the Monitoring Process

For RDx monitoring to operate fully and effectively, the monitoring process must be conducted in concert with RDx organizational memory. As we pointed out in the conceptual discussion of monitoring in general, there are several basic interrelationships. These can now be discussed in terms of RDx monitoring in particular.

a. Storage of Monitoring Information

As we discussed above, some information collected in the monitoring process will be specifically collected for use in decisions made some time after the information is collected. In addition, records about the operation of monitoring itself should be kept to facilitate organizational learning about monitoring. The design of monitoring must therefore provide for mechanisms to allow such information to be stored in memory.

This activity of storing information is identical to the link/transmission activity we have already discussed. In this case the collectors of information must have a way to know what information is to be stored, and where to send it to have it stored.

Care must be taken to prevent the storage of excessive amounts of information in memory. All of the issues discussed above in the section on when and when not to monitor apply here. The identification of indicators of the "future needs" type must therefore be carefully conducted -- a limited number should be chosen, trading off the potential usefulness of a given piece of information against the potential problems of storing it in RDx-memory, whether this is centralized or located in the organizations themselves. The same dangers will be encountered in private as in RDx memory, so care must be taken not to store excessively in private memory as well.

Another issue here is that the storage of RDx monitoring information in memory requires that the personnel performing the linkage/transmission activity have some mechanism which identifies where memory is located which will enable them to link information to the place or places to which it is to be sent to be stored. This is needed to insure that information is stored in the appropriate place. If it is not, it will become difficult, if not impossible, to locate and access that information in the future.

b. Accessing Monitoring Information from Memory

Given that monitoring information has been stored in memory, the problem becomes how to handle the process by which this information is accessed from memory by those decision makers who need it. This interaction between memory and monitoring requires that users of information have knowledge of what has been stored in memory, where it is stored and what steps are to be taken to actually get the information.

This requires, first of all, a mechanism like that just discussed, which identifies where information is stored. It is possible that a list of all information stored, and the storage locations could be constructed, and used by each decision maker when a piece of information is needed. Given a computer capacity this list could be computerized and made available relatively inexpensively. However, given the complexity of monitoring and the potential for a wide range of information, even this seems inefficient and very likely to be so complicated that memory would not be used by a large number of decision makers. Even if the complexity could be overcome, it is unlikely that any given decision maker will be able to master the range of available information, and be able to understand the complex and often subtle interrelationships among available information. Thus, information potentially useful to the decision maker could be missed. Developing such a mechanism will, then, be difficult, but it is necessary.

There is then a need for the establishment of procedures by which memory can be accessed. Such procedures would specify the steps to be taken to actually receive a given piece of information. This might include specifications of who to contact for a given piece of information, the forms in which accessed information could be delivered, the conditions under which a given participant may access memory, and ways to prevent directly accessing sensitive information without some device to safeguard confidentiality.

An alternative approach to accessing memory would be to provide a service within RDx consisting of individuals who are highly familiar with the memory and can link a given decision maker directly with a range of potentially useful informaton through a synthesis process like that identified by Rich (1977), in his discussion of Information Synthesis. By providing syntheses of existing information to decision makers, the utility of monitoring information stored in memory can be increased, and the use of memory by decision makers made more efficient and effective.

iii. Purging and Updating Memory

An issue that is highly related to the when and when not to monitor discussion concerns the occurrence of the problems discussed in that section as a result of the use of memory in the monitoring process. We have already mentioned the problem of overutilizing memory -- storing more information than the memory or monitoring process needs or can handle. The same set of problems can occur if the information stored in memory is not periodically updated. The continued storage of outdated information can result in the use of misleading information and the use of information that is no longer valid. Since monitoring is concerned with conditions that are changing the information can become outdated and must be corrected or updated to stay valid.

Closely related to updating is the purging of outdated information. Storing data that is no longer needed can lead to excessive storage costs and the danger that an outdated piece of information is wrongly identified as current and valid. Thus, misleading conclusions may be drawn from it, and inappropriate decisions made.

We do not mean to imply that all previously collected data should be eliminated. Indeed, the purpose of memory is to provide an historical perspective and to prevent losing the benefit of past experience. However, care must be taken to identify the information that will be useful in the future. Any information of this type should be clearly identified as to its date of collection and its timeliness. Other information should not be kept in memory simply to have it available "just in case."

Neither does purging imply that any information should be destroyed. It means that information is to be moved to inexpensive, perhaps less easily accessible locations and taken out of what might be called Active Memory -- that memory which is directly accessible at a given time. By purging it from active memory, the danger of its misuse or misinterpretation is reduced. By retaining it, it can still be used when needed for forecasting or for an historical evaluation of RDx or RDx monitoring.

C. Need for Orchestrating Memory and Monitoring

The close connection between memory and monitoring and the high level of interaction between them, requires that these be orchestrated. In addressing the orchestration issues raised in the discussion above, this should be considered as well. The success of monitoring requires that the interactions between memory and monitoring be smooth and not a source of conflict and confusion.

4. Incentives

As a loosely defined association of organizations, RDx becomes a difficult setting in which to orchestrate the interactions required by monitoring and to insure that any guidelines with respect to timing are more or less followed. As we pointed out, at the interorganizational level, solutions to such problems become difficult without establishing what may be perceived as an inappropriate and threatening control system.

In addition, monitoring itself (and the exchange of information within and across organizations it entails) may be considered by members of the participating organizations as threatening or too costly. Thus, some may prefer not to participate (or if participating, doing so at a low level of effort). By participation we mean several things: a direct participation in monitoring as a collector or transmitter of information; indirect participation as a user of monitoring information; and/or having organizational activities being monitored. This last sense of participation may include simply allowing one's activities to be monitored by people in another unit or organization, or monitoring such activities oneself and then providing this information to others.

These problems suggest that a major issue in the consideration and design of monitoring is the nature of incentives for active participation in monitoring and for respecting or legitimatizing the required orchestration activities. In one sense, this does not pose a major problem internally in most organizations. Formal reward systems do exist alongside formal authority structures. While these are not always effective, such mechanisms generally do work or can be designed to work towards creating motivation and coordinating the behavior of organizational members. The issue here, however, is the willingness of the organizations to apply their reward systems to the needs of RDx-related monitoring.

At the RDx level, few such mechanisms exist. While it is true that NIE, and the National Contractors may have some power vis-a-vis the other organizations involved (based on contractual or funding relationships), it is not clear that this power is appropriate or even sufficient to be used to insure participation or to orchestrate monitoring activities in a way that will be accepted as legitimate by members of other organizations.

Thus, the problem becomes one of how to establish interorganizational incentives for active participation in RDx-monitoring with cooperation and a willingness to exchange information and to orchestrate one's activities (or have one's activities be orchestrated) with respect to other activities. Incentives, then are defined as specific strategies to mediate the problems mentioned.

A. Disincentives

Before one can address how to create incentives for RDx-monitoring, it is necessary to more specifically identify the factors which will work to undermine participation, cooperation and orchestration within the RDx-monitoring process. These are referred to as disincentives. Several possible disincentives can be identified within RDx.

a. Cost

Participation in monitoring requires a commitment of organizational resources. Such resources may include money, staff and time to be used in the collection and transmission of information. Organizational members may resist committing such resources to the monitoring process.

b. Organizational Changes

Participation may require making changes in the organization. New positions or organizational units may be required to conduct monitoring activities. New tasks or responsibilities may be added to existing positions or units. Organizational members may resist making such changes in the organization.

c. Exchange Apprehension

Organizational members may fear the collection and exchange of information on their own activities, even if this information is important as an input into decision making in other organizations. Thus, they may resist having these activities monitored by other organizations in RDx or making such information available if they monitor it themselves. This is particularly important if such information is sensitive -- if it concerns such things as the success or failure of various projects/programs or states of development of RDx related activities.

d. Control Apprehension

As we pointed out, orchestration of RDx-monitoring is necessary but the potential exists for this to become, or be perceived, as outright attempts to control RDx-related organizations. This applies to the use of monitoring information in the orchestration of RDx itself as well as the orchestration of RDx monitoring activities. This apprehension may lead to RDx-related organization refusals to allow their monitoring activities to be orchestrated, or to even orchestrate them themselves. It may also lead to a refusal to allow their activities to be monitored, refusals to exchange such information with other organizations, and, in general, refusals to participate in monitoring in any way.

e. Other Disincentives

These four disincentives are by no means a detailed or complete list. Others can be identified at a conceptual level by thinking through the nature of the RDx-monitoring process and of RDx as a whole. As the RDx-monitoring process operates it is probable that others will be encountered. Thus, a more extensive and detailed list of potential disincentives should be developed before the monitoring process is designed. Such a list would be quite valuable in determining the degree and kind of incentives needed for the monitoring process.

B. Strategies to Create Incentives

Three general strategies can be identified to create incentives to deal with these problems.

a. Direct Incentives

By direct incentives we mean those incentives created by specifically establishing the legitimacy of authority relationships. Most internal organizational reward systems are of this type.[*]

The basic principle here is to overcome disincentives by providing alternative rewards to compensate for the disincentive for doing a given behavior or activity, or by making the cost of not doing a given behavior or activity greater than the disincentive associated with it. Thus, for example, pay is an alternative compensation for the disincentives involved in a given job such as time spent away from other activities.

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[*] The creation of legitimate authority relationships refers to the relationships between levels in an organization, or between any socially defined roles or positions. This specifically entails a situation in which a person who is given a directive by another recognizes this as something which is to be followed based on the right of the other person to issue that directive.

While such incentives can be created internally within the organizations associated with RDx, they are difficult, if not impossible, to establish for RDx as a whole. The cost of rewards and punishments would be high. Providing sufficient rewards for participation require the commitment of large amounts of resources. Further, negative sanctions may lead to resistance to RDx monitoring or even RDx as a whole. Some forms of direct, positive rewards may be appropriate for certain aspects of the monitoring process, but the use of even positive rewards involves evaluation and the potential for feelings of inequality or unfairness in their administration. Any use of such incentives should be limited and used only in conjunction with other strategies.

b. Indirect Incentives

An alternative strategy for creating incentives involves dealing with disincentives themselves. Given that such disincentives can be specifically identified, an incentive can be indirectly created by removing disincentives. This can be accomplished by using one, or preferably both, of two approaches.

1) Design Criteria

First, the monitoring process can be designed to minimize the occurrance of disincentives. This requires that specific design criteria be established to evaluate the design or operation of the monitoring process with respect to the disincentives. Such criteria can be established only by creating an extensive list of potential disincentives.

Such criteria would include such things as keeping the monitoring process simple in its early stages to reduce confusion about how it operates and to keep the costs of monitoring lower. A design in which monitoring activities are spread out over several organizations would remove disincentives stemming from imposing a large number of new activities on any particular organization. Disincentives stemming from concerns over the use or exchange of confidential information could be removed by either limiting the amount of confidential information collected or transmitted, or by masking the specific organization to which such confidential information refers.

At a more general level, the disincentives which may be inherent in the monitoring process can be minimized by designing monitoring activities as natural extensions of other activities performed within the organizations associated with RDx. The costs of and resistance to monitoring can be reduced by locating the monitoring of specific indicators in organizations or units which are, or should be, already collecting such information for other reasons. When information that is not already being collected by a given unit or organization is needed by the monitoring process, resistance to increased costs can be reduced by having those units which have a need or use for the information collect it. Similarly, the linking/transmission activities could be carried out by those units which already engage in such information handling activities.

2) Establishing Mechanisms to Reduce Disincentives

Some disincentives may stem not from the monitoring design but from the interaction of organizations or units in the operation of monitoring. Such disincentives can be reduced by providing various mechanisms to mediate between organizations to solve problems they perceive or experience by virtue of engaging in the monitoring process.

For example, conflicts between an organization monitoring and one being monitored may occur over what information is made available to the unit or organization carrying out the monitoring of a given indicator. Resistance to monitoring may result on both sides as a result of such conflict, or even in anticipation of conflict. Fear of conflict may become a critical disincentive. This disincentive can be reduced by establishing some kind of conflict management mechanism within RDx, such as arbitration by the RDx Management National Contractor or by creating a special group within the RDx monitoring process to clarity any confusions about the design.

Another disincentive of this kind would involve fear on the part of members of one organization that information generated in the monitoring process is being used by members of another organization to create a power base within RDx. The fear of inappropriate uses of information can provide a major disincentive within RDx-monitoring. This cannot be dealt with in the design of the monitoring process, but can be reduced by creating a process by which the uses of monitoring information are themselves monitored to check that information is not being used inappropriately. Another strategy here might be to create a process in which complaints about the uses of monitoring information can be investigated. By reducing the likelihood of inappropriate uses of information, this should become less of a disincentive.

A major disincentive that can arise out of the operation of monitoring is confusion about how monitoring activities are to be performed and how a given activity fits in with others. Faced with something as complex as the monitoring process, members of organizations or units may seek to avoid participating because they don't understand it and are afraid of the unknown consequences or responsibilities involved. This could be offset by establishing a program to educate members of the organizations associated with RDx about the nature of the RDx-monitoring process: how it operates as a whole, what is done with the information and how the various roles in the process are carried out. Such an educational program can reduce the apprehensions about what is expected of participants in the monitoring process, about the uses of information to control or influence the organizations involved and about the relationship of RDx monitoring to other RDx functions or processes.

c. Proactive Approaches to Incentives

Another strategy for creating incentives for participation in the monitoring process is to take a proactive stance with respect to incentives — undertaking positive actions to create a situation favorable to participation rather than merely reacting to existing conditions. Thus, in a proactive strategy, natural incentives would be created by having RDx-related organizations recognize the importance of monitoring for achieving both their own objectives and those of RDx.

The first approach, then, would be to demonstrate the importance and value of the monitoring process to the success of RDx as a whole. If we assume that there already exists some level of commitment to RDx (and why else would various organizations be involved?), it follows that demonstrating the need for monitoring for the success of RDx should lead to some level of commitment to monitoring. Such a demonstration must go beyond information about the internal operation of the monitoring process. It must focus on the rationale for the existance and use of monitoring within RDx, its importance to RDx, and the kinds of cooperative exchange of information and openness required for its success.

The second approach would be to build the monitoring/information needs of the RDx-related organizations directly into the design of monitoring. By more directly supporting the particular needs of these organizations, monitoring should become more obviously valuable to them.

In this approach it becomes critical to monitor the information needs of the constituent organizations to be aware of changes in their needs. Here, then, we are really talking about a process similar (but not identical) to need assessments carried out by RDx in its other activities. Many of the same techniques can be applied to the design and operation of RDx-monitoring.

Since not all needs can be served at once, a potential problem in both the these approaches is that tradeoffs must be made. Since different organizations will have different needs for their own activities and different perspectives on how to best accomplish RDx objectives, somebody is likely to be dissatisfied at any given time. This problem can be defused to some extent by having members of the various organizations participate in the decision making with respect to the needs served and kinds of information provided by the monitoring process. By participating, members will have an understanding of why certain things are included and others excluded and have a degree of commitment to the decisions reached.

The implementation of monitoring itself can be used to help build these natural incentives. By developing monitoring first with those organizations where initial interest is both positive and high, one can take advantage of what amounts to an already existing incentive for participation. By segmenting the development of monitoring in this way, one can give monitoring a chance to be demonstrated as useful by its own operation. The use of organizations for which the incentive already exists can help insure that monitoring will be successful enough to be demonstrated to other organizations.

These methods can all be enhanced by identifying the locations and causes of resistance to monitoring. This information can then be used to reduce this resistance by working directly with these people through specific consultations and explanations of the nature and utility of monitoring and even by building into monitoring specific values for the organizations these people represent.

This overall strategy can be considered as marketing in its best sense. The basic idea in marketing is this kind of demonstration of value and utility of a product or service. A proactive approach to incentives for participation in monitoring can benefit from taking advantage of the skills and techniques of marketing.

e. The Need to Mix Approaches

No single approach to building incentives or removing disincentives is likely to be sufficient in and of itself to insure effective RDx monitoring and commitment to RDx monitoring. Disincentives can be reduced to some extent, but it is not likely that all disincentives can be removed. By itself, a proactive approach would not be sufficient if the disincentives are strong. The very newness and complexity of monitoring may themselves create a threshold of resistance which must be overcome before members of these organizations are willing to participate. This threshold may require the use of proactive strategies to overcome resistance.

This issue is compounded by recognizing that the removal of disincentives is difficult and expensive. Even if there existed enough resources, it is not likely that there will be enough understanding of all disincentives to permit their identification and removal, especially in early stages of development. These must be learned as RDx monitoring operates. Indeed, the complexity of monitoring is such that it may not be possible to ever design a monitoring process which has no disincentives. By the same token, the creation of incentives through proactive strategies is expensive and is not a well understood process.

However, these various strategies can interact. By reducing disincentives and increasing the understanding and recognition of the value of monitoring, incentives can be created without total commitment and the existence of some disincentives can be tolerated. Thus, a mix of approaches would seem to be the most powerful and efficient mechanism for providing incentives for monitoring.

5. Monitoring the Monitoring Process

As the monitoring process operates, it will be necessary to collect information about its operation. In other words, the monitoring process itself must be monitored. Indicators concerning monitoring itself must be identified and procedures established for the collection and transmission of information about them. We refer to this process of monitoring the monitoring process as meta-monitoring.

A. Purposes of Meta Monitoring

A major purpose of meta monitoring is to provide information for the orchestration of the monitoring process. If orchestration is handled centrally (or by mutual adjustment by the members of organizations involved in monitoring themselves), information is needed about the activities being conducted by other people involved in monitoring. If monitoring is being conducted on an ad hoc basis, such information would be useful for directing monitoring activities in a given organization, and for providing RDx itself with a picture of the overall nature and level of activity and the state of development of monitoring in the various organizations.

Meta-monitoring can provide a basis for determining when support by RDx would help develop and strengthen the monitoring process.

Information about monitoring will be a crucial input to the organizational learning process in RDx with respect to monitoring. The complexity of monitoring makes it unlikely that a full understanding of how monitoring functions and how it should be conducted can be obtained without a good deal of information about its actual operation. The experiences encountered in monitoring are an essential in learning how to monitor.

Finally, meta monitoring is essential in evaluating the overall effectiveness of the monitoring process. This evaluation involves three things. First, is monitoring in general actually useful to RDx: is the information collected contributing to the success of RDx? Second, is monitoring as it is designed and conducted working effectively: does the design require modification? Third, is monitoring (as designed at any point in time) sufficient to RDx needs or does it need to be extended?

It is important to bear in mind that these issues are relevant even in a pure ad hoc approach to monitoring. Even if there is no central RDx role in monitoring, there is a need for this kind of information about monitoring activities across organizations. Furthermore, any given organization must be concerned with evaluating its own internal monitoring process for these same reasons: monitoring must be orchestrated internally, it must be supported, learning about it remains critical and its overall effectiveness and utility must be assessed.

B. Criteria for Monitoring: What is to be Meta-Monitored?

The indicators used in meta monitoring must be based on the purposes it serves, and these purposes all relate to some kind of evaluation of monitoring. Thus the indicators must be tied to specific criteria about monitoring. The criteria and the indicators to be used in meta monitoring can be derived from the discussions about the framework for monitoring and the previous major considerations. These can be organized around four central issues that reflect aspects of an answer to the question "Is monitoring working?"

a. Collection and Transmission of Information

A major issue in evaluating monitoring is a concern with whether information on the indicators specified for use in the monitoring process is being collected and transmitted, and whether this is being done appropriately. Criteria here could include the following.

- Information from indicators specified in the design of monitoring is being collected.

- Information on a given indicator is being transmitted to the relevant decision makers and to the appropriate memory.

- Information is transmitted while it is still timely.

- Information is being collected and transmitted only when it is relevant.

- Individuals collecting information and those using it are not overloaded.

- Memory is being purged and/or updated when appropriate and is not overloaded with irrelevant information.

- Channels for the transmission of monitoring information are available, known and being used.

Information of this type can be useful in determining where the interactions among organizations (or their subunits) are hindering the process. It can be used to determine the extent to which the operation of the monitoring process conforms with the design. It will also aid in determining specifically where monitoring is breaking down, if anywhere, and where effort is needed to "repair" it.

b. Utility of Information

Another issue in evaluating monitoring concerns the usefulness of the information collected. This specifically centers on the users of information and their reactions to and uses of this information. Criteria about the utility of the information should reflect the impact of monitoring on these decision makers and their activities. As such this class of criteria gets to the very general issue of whether monitoring is indeed serving the purpose for which it was designed. Some criteria concerning this could include some of the following.

- Information provided by the monitoring process is actually being used by decision makers.
- Indicators being monitored reflect the needs expressed by the users and potential users of monitoring information.
- Decisions made within RDx are improved by the input of monitoring information.
- Decision makers request existing monitoring information when conducting specific activities.
- Decision makers request that additional indicators be monitored.
- Users of monitoring report satisfaction with the information provided.

These criteria should be applied to each indicator used in the monitoring process as well as to monitoring information in general. Information of this kind can thus be used to help determine those indicators which are not useful and should be dropped as well as to evaluate the overall utility of monitoring.

c. Information on Design, Operation and Development

Apart from issues about the collection/transmission and use of information, a class of relevant criteria concerns the design of monitoring itself. In this class the issues center on the question of whether the design itself is interfering with the monitoring process, and undermining its utility. Criteria in this class could include the following:

- Is the approach — ad hoc or formal — appropriate to the needs for information on monitoring?
- Can decision makers get all the information they need given the approach?
- Is the design flexible: are indicators being adapted, or replaced with respect to changing conditions?
- Does the design have features which are creating disincentives for participation?
- Are the incentives provided working -- are people providing information to monitoring personnel?
- Is there sufficient flexibility in the design to allow experimentation to facilitate learning about monitoring?
- Are issues regarding when to monitored considered?
- Are channels overloaded?
- Are capabilities developing?

These criteria provide a basis for evaluating the design of monitoring. This will facilitate learning and making changes in specific aspects of the design and modifying the approach taken based on the actual experiences with monitoring. These will also aid in identifying conflicts or inconsistancies in the design which may require specific efforts of orchestration.

d. The Development of Monitoring

The creation of the RDx-monitoring process cannot be accomplished in a single effort, nor may all organizations be able to develop the capabilities needed to participate in monitoring at the same time. Furthermore, the monitoring process must adapt over time to changing needs within RDx and to new conditions in the RDx context. Thus the monitoring process must emerge and change over time, and this process of change must be monitored as well. Some criteria here would include the following:

- The design of monitoring is flexible: new indicators are added, and old ones dropped.
- Different organizations are at approximately the same level of development.
- Among those organizations participating, capabilities for monitoring are developing rapidly enough to provide needed monitoring information.
- New channels for transmission are being added as more information is collected and as additional organization or subunits request it.
- User needs for information are being identified to provide a basis for extending the monitoring process.
- The overall development of monitoring is consistent with the intended directions for development.

These criteria will permit the orchestration of the development of monitoring over time to insure a sufficient level of consistency in the development of monitoring for its operation. They will help pinpoint where support is needed by a given organization to speed up its own development of capability. They will also provide a basis for determining where the development of the monitoring process requires redirection to insure that at any given time it is operating as intended.

C. Design of Meta Monitoring

The meta monitoring process can be designed in the same manner as monitoring itself. The starting point must be the purposes to be served by meta monitoring and the criteria used in the evaluation of monitoring such as those we have discussed. Given these, the design of the meta monitoring process must consider the same issues as have been discussed for the monitoring process itself. These issues include:

1) Indicators

As with monitoring, meta monitoring indicators must be established based on the types of information needed both for current and for future needs. The criteria for the conduct of monitoring activities, the utility of information provided by monitoring and the effect of the design on these thus provide a basis for identifying and picking indicators to be used.

2) Who Collects Meta Monitoring Information

As in RDx monitoring itself, the issue must be addressed as to who should monitor monitoring. The issues raised above concerning access to information, cost differences in who collects this information, and so on are equally important here. As before, it is important to recognize that different organizations or groups of organizations may be able to collect information on different indicators more effectively or with less resistance than others. The question must be whether to have each group of organizations collect different information on different indicators, collect information of the same indicators, or to have a single organization or group of organizations collect information on all indicators.

3) Who Needs Meta Monitoring Information

The other side of the "who" question is where meta monitoring information is needed. It is important to note that each group of organizations associated with RDx monitoring will have an interest in evaluating monitoring in terms of their own activities, short term orchestration of their own activities with other activities in RDx, and more long term evaluations of the usefulness of their participation in the RDx monitoring process. This implies the need to identify the indicators on which each organization or group of organizations need meta-monitoring information.

These issues can be represented in an overall framework for the design of meta monitoring. This is shown in Table II. It parallels that framework provided for RDx monitoring itself. Its use is the same. By locating indicators in the cells it is possible to design and describe the structure of meta monitoring. As with monitoring, meta monitoring must be approached as a dynamic process. The considerations discussed earlier concerning interorganizational relations, orchestration, timing, memory and incentives all apply in the same way to meta monitoring as they do to monitoring itself.

	Collection of Meta-Monitoring Information								Use of Meta-Monitoring Information							
	NIE		Contractors		Exchanges		State Education Agencies		NIE		Contractors		Exchanges		State Education Agencies	
	FN	CN	FN	CN	FN	CN	FN	CN	FN	CN	FN	CN	FN	CN	FN	CN
Collection/ Transmission Indicators																
Utility of Information Indicators																
Design/Operation Indicators																
Development Indicators																

FRAMEWORK FOR META-MONITORING

TABLE II

V. DEVELOPMENT

The discussion up to this point has been concerned with providing a range of concepts and definitions relating to various aspects of monitoring processes in general and the RDx monitoring process in particular. These concepts can be used as a basis for organizing one's thinking about monitoring and are important considerations in the actual design and operation of monitoring within RDx. In this section we will make use of these concepts to address two issues related to the design and operation of monitoring: the establishment of RDx monitoring as a viable process and the translation of these concepts into concrete, specific aspects of an actual monitoring process.

1. Overview of the Development Process

Pragmatically, the establishment of RDx monitoring must be seen as an incremental process. Developing a full-blown RDx monitoring system in one fell swoop is not a viable option because:

- monitoring is a complex process;
- experience with RDx and with RDx monitoring will be needed in order to develop our understanding of them;
- acceptance of and support for RDx (and thus even more so for RDx monitoring) is not yet a "given";
- as RDx matures, changes in its purposes, context, participants and activities will occur — changes which will require changes in the monitoring process (cf. Bean and Rogers, 1977);
- similarly, as RDx monitoring itself matures over time, changes will be needed.

We therefore conclude that RDx monitoring should emerge incrementally over time — a process we refer to as the development of RDx monitoring. This process will thus involve many "cycles" of development. In each cycle of the development process, the concepts that we have discussed in the paper so far must be translated (i.e., "operationalized") into the various aspects of the design of monitoring: activities, indicators, processes, structures, responsibilities, etc.

While we recognize that a development process is not always a "clean-cut", linear process, it will be helpful (especially in initial stages) to consider the development of RDx monitoring as a process consisting of four basic steps — plus a "redesign step" which starts the development process again in a new "cycle" (see Figure 2):

1) Design

   Translating concepts into specific facets of a design; translating needs for information about various aspects of RDx and its context and operation into indicators; translating collection, storage and transmission of monitoring information into responsibilities of personnel and organizations; translating the need to share information among the participants in RDx into interorganizational channels for information transmission and exchange.

2) Build

   Translating the RDx monitoring design into actual capabilities.

3) Operate

   Translating the RDx monitoring design and capabilities into actual, specific activities for collection of infor-

Figure 2

FRAMEWORK FOR META-MONITORING

	Collection of Meta-Monitoring Information								Use of Meta-Monitoring Information							
	NIE		NC		RX		SEA		NIE		NC		RX		SEA	
	FN	CN	FN	CN	FN	CN	FN	CN	FN	CN	FN	CN	FN	CN	FN	CN
Collection/ Transmission Indicators																
Utility of Information Indicators																
Design/Operation Indicators																
Development Indicators																

mation by monitoring indicators, transmission of this information and use of this information by decision makers.

4) Evaluate and Learn

Assessing the appropriateness and effectiveness of RDx monitoring design and operation in terms of the effects of monitoring on RDx; the usefulness of monitoring information; the constraints within RDx or its context which interfere with the operation of monitoring; costs, inconsistancies and other design problems concerning monitoring; changes in the stage of development of RDx; changes in the educational R&D system; changes in the purposes and participants in RDx; forecasts made by RDx participants about future changes; or changes in the understanding of RDx and its context that result from organizational learning.

We may note here two points about evaluation and organizational learning. First, it is important that meta-monitoring processes and criteria (i.e., monitoring of RDx monitoring) be included as part of the initial design process in order to insure that information relevant to later evaluation and learning will be obtained. Second, the evaluation of RDx monitoring is, in general, based on the experiences of RDx participants actually involved in monitoring. As the monitoring process operates, organizational learning should occur as problems are encountered and solutions are tried, and as information shared across organizations about different experiences with monitoring. Such sharing of information about the outcomes of actions taken is crucial for organizational learning to occur -- learning which increases our understanding of how the monitoring process works.

5) Redesign

Beginning the next "cycle" of development.

Redesign may focus either on modification (including termination) of design aspects which are judged inadequate or inappropriate and/or extension of the scope of RDx monitoring.

Redesign may be based on increased understandings about RDx monitoring (how it works, what impacts its effectiveness); the modification or extension of the purposes or activities of RDx as it emerges and matures over time; the emergance of new factors in the context of RDx (such as new types of producers of educational innovation) and changing conditions in the context (such as new sources of funding). Under the above conditions, new indicators may be needed, new procedures developed or other changes in monitoring made.

Two further points may be made here. First it should be pointed out that a range of ways of organizing and carrying out monitoring activities is needed, at least in early stages of the development of the monitoring process, to provide a basis for establishing what works and what does not work. Second, because the development process involves the adaptation of monitoring to changes in the RDx and its context, development will continue after the monitoring process has become operational and is established within RDx.

2. Step No.1: Designing RDx Monitoring

A. Initial "Base Decisions"

While the total, long term development process for RDx monitoring may be seen as a series of developmental cycles, there must be an initial "starting point" from which to start the development process. That is, there are some initial "base decisions" which must be made as RDx policy before the first design/build/operate/evaluate cycle begins. These concern: the approach to be taken (ad hoc/formal); centralization/decentralization; purposes; organizations to participate (at least initially) in monitoring.

The "pre-design" issues are discussed below. First, however, several observations need to be made.

1) These issues are, in effect, RDx system issues. Decisions made on these issues will be determinative of many of the specific RDx monitoring design features. It is for this reason that we "separate them out" as "pre-design", base decisions.

2) Initial decisions on these issues must be sensitive to the more mid and long term direction that RDx monitoring might take. For example, if the ultimate goal is a systematic RDx-wide monitoring process, but an ad hoc approach is taken in early stages of development, care must be taken to insure that the result is not a number of fragmented monitoring processes across different organizations which cannot be integrated later.

3) Precisely because these are RDx system issues, the decision process must include the full range of RDx participants — even if not all will participate in the initial RDx monitoring process — in order to:

a) the RDx monitoring process will realistically reflect both the monitoring needs of the RDx as a whole and the differing needs and perspectives of the different RDx participants;

b) that all participants will have a stake in the initial efforts and the long term development of RDx monitoring.

4) Some mechanism must be provided for RDx-wide discussion and decision on these base issues.

5) While we will discuss each "base decision" issue separately, their interaction on each other must be recognized. (For example, decisions about purposes will affect decisions about the approach to be taken; decisions about approach will affect what purposes can be achieved.)

6) As RDx system issues, these issues are, in effect, "predesign" issues for each cycle in the development of RDx monitoring. However, the discussion below will be oriented to the initial development cycle.

Approach: Ad Hoc or Formal?

One of the first base decisions that must be made by RDx is the extent to which RDx monitoring will be done on an ad hoc and/or formal basis. We have already noted that, at least in the initial stages of development, an ad hoc approach has some distinct advantages:

- flexibility and experimentation, which contributes to experience and organizational learning
- less risk and cost

Consideration must also be given to the disadvantages of an ad hoc approach:

- potential lack of consistency across organizations in type of data collected, methods and indicators used, rate of development
- lack of opportunity for experience and learning regarding the interorganizational aspects of monitoring.

If an ad hoc approach is used in the early stages of RDx monitoring, we would suggest the following as a minimum but necessary set of integrative activities:

- Provide a mechanism to orchestrate the development of monitoring across RDx-related organizations; as desired, to provide individual organizations with information not so easily obtainable by the separate organizations; and to facilitate experience and learning regarding the interorganizational aspects of RDx monitoring.

  This could be a unit within one of the National Contractors which can orchestrate RDx monitoring by providing guidance to individual organizations in the design and operation of monitoring, serving as a clearinghouse for solutions found by the organizations to problems, monitoring the development processes in individual organizations, and providing help when needed.

- Establish a minimum core of common or interrelated monitoring activities which are built into the monitoring processes of each organization.

- Make a tentative decision about the more long term approach to RDx monitoring so that initial RDx monitoring designs, policies and strategies can facilitate the more long term development of RDx monitoring.

If a more formal approach is taken, the above three areas of concern would become the primary foci for design purposes.

Purposes of RDx Monitoring

Monitoring is a "purposeful" activity. Thus, to provide a basis for designing RDx monitoring, some initial decisions must be made concerning which monitoring purposes are most critical to RDx in its early stages of development. One or more of these purposes must be chosen as a basis for designing RDx monitoring -- depending in part on decisions whether the initial RDx monitoring is to be relatively limited and experimental or more extensive. While our primary concern here is for the initial stages of development for RDx monitoring, consideration should be given to purposes which can/should be "incrementally added" over time.

Participation of RDx-Related Organizations

A third base decision which must be made concerns the issue of which RDx-related organizations will/should be involved in any aspect of monitoring (collection, storage, transmission, etc.) in the early stages of the development of RDx monitoring. For example:

- Should all Rxs be involved, or should the first "cycle" of the RDx monitoring design involve only two or three Rxs in order to provide some initial experimentation and learning, to reduce the initial level of risk and cost, and to keep the initial RDx monitoring process relatively simple? Are all Rxs sufficiently committed to be involved initially?

- Should SEAs be involved in the first cycle of the RDx monitoring design — or is the risk too great or the commitment too low? Which SEAs: all, a few or only those SEAs related to one or two (but not all) Rxs?

- What should be the roles of NIE and the National contractors in the early stages of RDx monitoring?

Limited participation provides one type of "incremental" strategy which reduces risk and cost, allows experimentation and keeps the initial design relatively simple. At the same time, it also tends to limit the range of experience and insights gained and poses a danger of losing the momentum of initial interest and commitment.

Centralization/Decentralization of Data Collection

An ad hoc approach implies a basically decentralized design (each organization does its own data collection) — with, of course, some mechanism for orchestration, as discussed above. A formal approach does not per se imply centralization. Nonetheless, to the extent that specialization of roles and functions is built into a more formal approach, some degree of centralization is implied. The discussion of the overall development process suggests that in this early stage of development a decentralized design process is advantageous. This is not, however, a foregone conclusion.

B. The Design Group

Obviously, some design group must be established. Here, three issues are relevant.

Location

If a centralized process of RDx monitoring is used, there would be a single RDx design group. If, on the other hand, an ad hoc or decentralized RDx monitoring process is used, then each participating organization would establish its own design group.

Form

If several RDx-related organizations are separately designing their own monitoring processes, their design group could be a formal unit (which would then also be responsible for building, operating and evaluating the monitoring process), a standing committee, a project task force -- or even an individual. These groups can be established either as formal units within RDx or the organizations, or as standing committees or project teams cutting across several units. It is preferable to create formal units from the perspective of having a single mission in design, and to establish a working unit whose members are committed to the design. There are some problems with this, however. Creating a new unit may meet resistance from the organization, especially if particular department heads feel that their department should be responsible for monitoring. Such a unit would also require creating new administrative roles such as the clerical and managerial positions required. In general, each organization will have to determine the appropriate "form" of its design group.

Members

If a single, centralized RDx design group is used, its members should include representatives from each of the RDx participant groups (NIE, National Contractors, Rxs, SEAs). If there are to be separate design groups in individual RDx-related organizations, each organization will need to determine which of its personnel/ groups should be represented.

C. The Design Process

Before discussing the design features, we can suggest some design process guidelines

1) Inputs should be sought both from relevant administrators and from the potential users of monitoring information in order that monitoring may be accepted and yield useful information.

2) Milestones and deadlines should be established for each step of the design process. Without some targets, the design process might take a great deal of time to develop.

3) If monitoring is being designed in separate organizations, these milestones should be coordinated across organizations to orchestrate design activities and the development of RDx monitoring across organizations.

4) When problems are encountered by the design groups in different organizations, the designers should seek advice from other organizations involved in the design of monitoring. This serves two purposes. First, if a problem is encountered by one organization, it is likely that another has (or will) encounter it. Second, it will help maintain a level of consistancy across designs.

5) The design of monitoring should be compatible with other processes and systems that provide information to policy and decision makers.

D. Design Issues and Features

From the earlier conceptual discussion of RDx monitoring, we can identify a number of design issues and features which should be considered by the design group -- regardless of whether there is a single, centralized RDx design group or there is a design group within each individual RDx-related organization. These design issues and features (discussed below) are:

- Determination of needs
- Indicators
- Who monitors
- Timing of information collection
- Incentives
- Fail-safes
- Meta-monitoring
- Evaluation criteria

Determination of Needs

A major design issue of RDx monitoring revolves around two information need questions:

1) What are the information needs for RDx monitoring?

2) Which will be included in the RDx monitoring design (especially in early stages of development)?

Translation of Purposes into Needs

The above questions should be answered by translating purposes into the specific information needed about and for specific activities of RDx and/or RDx-related organizations. However, it must be recognized that in an immature system such as RDx, this is a particularly difficult activity. Translating purposes into specific information needs can at best be only a matter of estimation. Therefore, any determination must be treated as tentative, and a design based on such information needs must be carefully examined and evaluated over time to determine if in fact the information needs identified do realistically apply to specific monitoring purposes.

Analysis

The analysis of information needs should initially cover all the functions or activities of RDx and/or RDx-related organizations. However, decisions will have to be made as to which information needs should be included as a basis for designing RDx monitoring. These choice decisions would be based on such considerations as relative importance, cost, availability and acussibility of indicators, and the earlier base decisions about purposes, approach, etc.

Guidelines

While the actual decisions about informatin needs will be specific to any particular situation, some guidelines can be suggested to help in the decision process.

- Involve potential users of monitoring information

  Potential users of monitoring information should be involved in identifying monitoring information needs both in order to develop their commitment to the process and because the design group is not likely to have a sufficient understanding of the RDx or RDx-related organization to conduct the information needs analysis on its own. At the same time, however, the final decisions must be free of the specific interests of particular users and reflect an overview of the design which only the members of the design group will have. Thus, final decisions should be made by the design group.

- Limit the range of information needs

  To do otherwise would be expensive and (especially in the initial design) risky. Thus, the various information needs must, in some manner, be ranked in importance relative to purposes.

- Information needs may be wrongly specified

  The actual utility of any need can only be determined by the operation and use of monitoring. Thus certain "guesses" may be needed and these should be made. Correction can occur which will allow a better specification of needs in the future.

- Identify the user of information

  This is essential for establishing linking mechanisms to facilitate the transmission of monitoring information to those decision makers who need it. (In an ad hoc approach to monitoring this involves only the decision makers in the particular organization.)

- Create an information need/decision maker index

  This will facilitate the transmission of information when it is collected. In a centrally designed, more formal monitoring approach, this requires linking the information collected with the participating organizations _and_ with decision makers in those organizations who need the information.

Indicators

Once a set of information needs is established the next step is to identify and select indicators which, when monitored, can provide the needed information.

The design group should first establish a list of possible indicators for each of the information needs. While the identification of indicators will essentially be a process of brainstorming by the design group, possible indicators may be suggested by:

- the types of indicators used by other information systems in education and in other kinds of organizations
- the ideas of other RDx monitoring design groups (if a decentralized approach to designing is used)
- relevant RDx-related decision makers

Once a list of possible indicators has been established the design group can choose those which are to be used in the monitoring design. The number of indicators selected will depend primarily on the "size" of the increment to monitoring being designed.

The result of this process would provide a documentation of the process for translating (1) functions and objectives (of RDx and/or RDx-related organizations) and the tasks or activities to be performed into needs for information, and (2) these needs into the specific indicators chosen for the use in the design. The choice of indicators must be done before the rest of the design can be worked out. However, after other aspects of the design are created, it may become necessary to modify the choice of indicators. Therefore, the list of indicators chosen should be considered only as tentative until the initial design is established.

From our earlier conceptual discussion, we may suggest some guidelines for the process of identifying and selecting indicators.

Guidelines for identifying indicators

- The initial list of possible indicators should be fairly broad. It is better to "cull the list down" later than to overlook potentially useful indicators.

- Indicators should reflect a specific aspect of the needed information. If indicators are general, or reflect a wide range of information, they are difficult to intrepret and so are less useful.

- Indicators must be accessible. That is, it must be possible to actually collect information about a given indicator. It is possible to identify indicators which would be useful in theory but about which insufficient information can be collected.

- Indicators should be identified in terms of the methodology and feasibility of their measurement and collection.

- Several indicators should be identified for each information need. Since any given information need will have several facets, each of these facets should be represented by at least one indicator. If possible, several indicators be identified for each facet so that the monitoring process isn't dependent on a single indicator and/or that a choice among indicators can be made.

Guidelines for Selecting Indicators to be Used

- Unobtrusiveness

  In selecting the indicators to be used, preference should be given to those which can be monitored without directly interferring in the activities of RDx and its organizations. Indicators are also preferable if they can be protected against distortion.

- Information already being collected

  This will help reduce the costs of monitoring, and will facilitate the orchestration of monitoring with other RDx or organizational activities.

- Multiple Indicators

  This will reduce the sensitivity of monitoring to error and increase the reliability of the information collected. Different indicators will also provide different perspectives for a given piece of needed information, and so will provide fuller, more realistic information.

- As simple as possible

  While complex indicators (i.e., those which involve complicated combinations of information) may be necessary for some information needs, they are both more expensive and more difficult to interpret.

Timing of Information Collection

Collecting too much information (or collecting information too often) in the monitoring process can result in a waste of resources, overloading both those people collecting, analyzing or using information and the channels used to transmit information, misintrepretation, inappropriate information and resentment.

Thus, the design of the monitoring process must include for each indicator a rule or guideline which specified how often and when it is to be collected. In creating these rules the following suggestions can be useful starting points.

- An indicator should be monitored only as frequently as needed to identify a change in the process, activity or condition it reflects. This is difficult to establish, of course, but an estimate should be made based on information about that process, etc.

- Indicators should generally be collected on a regular basis, at specified times. However, it is important that mechanisms be established to trigger monitoring of an indicator whenever other information indicates that it will be useful to do so.

Disincentives

In designing the monitoring process, care must be taken to remove or neutralize disincentives to cooperation and sharing of information. Some basic design strategies could include the following:

- Minimize costs to participants

  This can be accomplished by keeping the process simple in early stages of development, and by adding to its complexity only slowly. Also, the design should spread costs over several participants rather than concentrating costs in a few organizations or organizational units.

- Insure confidentiality

  A major disincentive identified above was a fear of private or sensitive information becoming public. This fear can be diffused by insuring that sensitive information cannot be directly linked to particular organizations or units. This requires that the design group establish criteria for sensitivity, since some monitoring information may be less useful if not specifically tied to a given organization or unit.

- Do not require major organizational changes of participants

  Major organizational changes can be avoided by assigning monitoring activities as a natural extension of their other RDx activities.

- Provide participants with equal access to information

  Unequal access to information can be used to increase the power or influence of a given organization or unit over others. Organization members may fear providing information in the monitoring process on these grounds. Therefore, the design of monitoring should insure that any organization can access information.

Incentives

Avoiding or minimizing disincentives is a necessary but not a sufficient condition for monitoring. Additionally, there must be proactive incentives for cooperation and exchange of information.

Incentives may in some cases be provided through the formal reward systems of participating organizations. However, where no formal reward systems exist (as would be essentially the case for a centralized format for RDx monitoring) or where existing organizational reward systems are not deemed adequate (as may well be the case for a decentralized format for RDx monitoring), specific incentives must be built into the monitoring design.

Fail Safe

RDx monitoring involves a number of interdependent activities, organizations and/or organizational units. RDx monitoring is a new and relatively uncertain process -- as is the RDx system itself. Under conditions such as these, the potential for failure in monitoring is rather large. It is thus important to design RDx monitoring in a "fail safe" form -- i.e., in such a way that a failure in one aspect of monitoring does not cause the total monitoring process to break down and become "suspect". Indeed, such a "total" breakdown in RDx monitoring would not only result in loss of information needed by decision makers -- it could undermine support for RDx itself.

- Flexibility

  The flexibility to fine tune is an important fail safe mechanism of this kind. This allows problems to be corrected locally before their effects are profoundly felt in other parts of the process or by users of information.

- Documentation

  Records of what changes are made in the monitoring process also provide a fail safe device. By documenting changes made to solve particular problems, these "solutions" can be used when the same or similar problems appear again -- thus cutting down on the chances that such problems will persist and affect other aspects of monitoring or other organizations/organizational units.

- Redundancy

  A traditional fail safe device is to build redundancy into a system at critical points; that is, at places where failures are highly probable or where a failure will have important affects on the rest of the system. In the case of the RDx monitoring process, this redundancy could entail having particular indicators monitored by multiple participant organizations or by more than one person in a given organization. It could also include using multiple communication channels between organizations; using multiple media for transmitting information among organizations; having information stored in memory in more than a single organization. Thus, if a failure occurs in a particular aspect of monitoring, the information or communication is not lost.

Such redundancy entails a real cost of course and should be limited to the most critical aspects of the monitoring process. These can only be determined by a careful examination of any particular monitoring design.

Criteria for Evaluation of Monitoring

Criteria for the evaluation of monitoring should be established in the design step in order to:

- avoid disagreement about evaluation criteria during the actual process of evaluation
- avoid having criteria biased by or limited to operational perspectives (though operational experience may later suggest new or modified criteria)
- provide a basis for the selection of appropriate meta-monitoring indicators (i.e., for information needed to evaluate RDx monitoring)

In the early development cycles of RDx monitoring, evaluation criteria should be concerned with such issues as how well the monitoring process is working; identification of problems; major RDx-related changes which require redesign of monitoring (e.g., changes in RDx purposes, goals, activities, context). These criteria should be established by the design group (which is most familiar with the design).

In later development cycles of RDx monitoring evaluation criteria will be needed concerning such issues as monitoring outcomes and costs; the value of monitoring information to users. Since these issues involve broader issues than just monitoring design issues (e.g.: decisions about the continuation of and commitment of resources to monitoring), these evaluation criteria should be established by the design group in collaboration with relevant administrators.

The following brief guidelines will be helpful in establishing evaluation criteria.

- Evaluation criteria should realistically reflect that which is to be evaluated.

- Evaluation criteria should be relevant both to the design and to the developmental stage of RDx monitoring.

- Evaluation criteria should be measurable, and in establishing a given criterion the procedure for measuring it should be specified.

- Information relevant to each evaluation criterion must be obtainable.

Meta-Monitoring

Meta-monitoring provides a basis for short term coordination of short term monitoring activities and of the more long term development of monitoring.

It is essential, then, that meta-monitoring be incorporated in the design of monitoring in the initial monitoring design. The process of designing meta-monitoring is the same as the design of the monitoring process itself. The same decision points, issues and guidelines are applicable.

One additional point, however, should be raised. In designing monitoring in a decentralized, ad hoc approach, meta-monitoring is needed not only by each organization, but also by the central group or "translator" unit which is serving to orchestrate the separate design and development processes in each organization. This group will require information on the states of development in each organization, the problems encountered in each stage of development, and the overall effectiveness of the approach taken. Naturally, these same things are needed by the unit responsible for RDx wide monitoring.

E. Criteria for Evaluation of the Monitoring Design

In the process of designing monitoring, several criteria should be kept in mind for evaluating and approving the design before it is used to build and operate the monitoring process.

- The design should include sufficient detail to allow it to be used to build and operate monitoring
- The design should be simple in early stages to reduce the cost of and risks in building and operating monitoring.
- The design should be feasible in the sense that the capabilities required can be built in a reasonable period of time, and at a reasonable cost.
- The design should provide sufficient flexibility to allow for experimentation with and fine tuning of the monitoring process so that organizational learning can occur, and the risks of failure can be reduced.
- The design must be internally consistent: the procedures and guidelines specified in the design for the operation of monitoring should not conflict with each other.

3. Step No. 2: Building RDx Monitoring Mechanisms and Capabilities

The design of the monitoring process (whether it be RDx-wide or specific to differing RDx-related organizations) serves as a blueprint for actually building the mechanisms and capabilities needed for monitoring. In this section, then, we discuss some basic aspects of and provide some guidelines for this building process.

A. A Monitoring Unit

As specified in the monitoring design, some organizational unit* will be needed to supervise monitoring and to provide a transmission link between decision makers and information collected by monitoring. In a centralized design this unit would conduct monitoring activities. In a decentralized design it would be more involved in coordination.

Depending upon the design, the activities of this unit could include: the collection, collating/synthesis of information; its temporary storage until it can be transmitted; the actual transmission of information to decision makers; the monitoring of the monitoring process; and the coordination of the monitoring process. In building the unit, these activities must be translated into necessary skills; specific jobs or positions within the unit must be established; personnel must be trained or hired.

In creating this unit, it may be useful (at least initially) to build it around the design group. This group of individuals will have a far better understanding of the monitoring process as it is designed, and are most qualified to participate in monitoring and in the building of the monitoring unit.

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*In its simplest form, this "unit" could conceivably be a single individual or position -- though we doubt this will be the case.

B. Information Channels

In general, two types of information channels will be needed:

1) Between the monitoring unit and the users of information -- so that information can be transmitted to those decision makers who need it, and so that the users can provide the monitoring unit with information on changes in their needs and the usefulness of the information they receive (the channels required here can be identified by examining design specifications about who needs eacy type of information).

2) If monitoring is decentralized, between the monitoring unit and those organizations and/or units within organizations which collect information -- so that the monitoring unit can provide direction and receive information.

Some guidelines can be suggested for building these channels

- Specific individuals should be identified at either end of of the channel.

  By specifying the individuals (or positions) involved, the information sent over a channel is more likely to be received by the individual who needs it. If the communication channels are merely between units or work groups, communication is less direct.

- The content, or type of information, carried by a channel should be specified in advance.

  By limiting the use of a given channel to particular kinds of formal communication, there is less danger of channels being overloaded and of information being irrelevant.

- The media used in a channel should be specified in advance.

  The particular medium used in a specific channel (e.g.: phone calls, memos, formal reports, face-to-face conversation) should be specified on the basis of the nature of information being communicated (e.g.: the volume of a given message; the need for a record of the message; potential need to clarify a message by direct conversation). Naturally, some channels may make use of various media for different kinds of communication.

- Channels should be formally used only when there is a need to send information.

  Generally, channels would be formally used when new information is obtained from the monitoring of indicators. However, such new information need not always be sent each time it is collected.

- It is advisable to build in redundancy.

  This is a major 'fail safe' strategy. The failure of a given channel may undermine the entire process. By providing alternative channels between individuals or units, this danger can be reduced. Further, sending the same message over more than one channel can reduce the danger of information being lost.

C. The Monitoring-Memory-Decision Maker Linkage

In order that monitoring information may be available for future use, it is necessary that:

1. organizational memories be built (the nature and number will depend upon the RDx monitoring design);

2. linkage mechanisms/channels exist between the monitoring units and the memories (for storage);

3. linkage mechanisms/channels exist between the memories and decision makers (for access);

Storage and access will require some kind of index and procedures, but (in a decentralized approach) the nature of these would be determined by the relevant RDx organization.

Generally, we would expect that the monitoring unit would be responsible both for storing information in and (though not necessarily) for accessing information from memory. Thus, the monitoring unit not only provides a data-gathering function but also a critical linkage function.

D. User Education

It cannot be assumed that RDx monitoring will "fly" simply by being designed and built well -- user understanding of and incentive to use RDx monitoring is also critical.

For users to apply monitoring information appropriately and realistically to decision making they must understand:

- the source of information and how it was collected

- that monitoring is only one source of information -- and that other information may be necessary

- where to get other information -- and how it is related to monitoring information

The education of RDx personnel with regard to monitoring can be used in a proactive approach to creating incentives. Such an approach would be directed at increasing the commitment of RDx-participants to monitoring, both as users of and as active participants in the monitoring process. This would also seek to establish norms for the exchange of information among RDx organizations. In effect, this implies the "marketing" of an RDx monitoring in the sense of honestly explaining and demonstrating:

- the nature, need and usefulness of monitoring and the sharing of information

- how monitoring operates

- those aspects of the RDx monitoring design which limit disincentives

- those aspects which provide for equality of access and which guard against an organization being placed at a disadvantage if it shares information

- the limits of monitoring (to avoid unrealistic expectations from monitoring which can lead to dissatisfaction and eventual resistance to the participation in and use of monitoring)

- the need for informed input from users about the monitoring process

In establishing this program, it will be helpful not to limit the participation to the current users of monitoring information. Potential users should be identified and included in the program.

4. Step No. 3: Operating RDx Monitoring

The building step creates the capabilities for the operation of monitoring. Operation, then, is the use of these capabilities to perform the activities specified in the design. There are, however, some basic issues to bear in mind in the operation step of the development process.

A. Start Up

It is imperative that monitoring not begin operation until the capabilities have been sufficiently built. If collection of information starts before the monitoring unit has the ability to handle incoming information (whether it is collected in this unit or not) or before communication channels have been established, serious overloads may occur which can undermine the entire process. Thus, the decision to initiate monitoring activities must be made on the basis of an evaluation of the state of capabilities needed for those activities.

B. Need for Flexibility

In operating the monitoring process, especially in early stages of development, activities should be conducted with flexibility. Since no design will be perfect, those involved in monitoring must be able to make corrections in order to overcome errors in the design and provide a basis for organizational learning. It is important, however, that deviations from the design be documented and that the monitoring unit have a record of such deviations.

Further, any deviation should be checked so that adjustments in other activities can be made as needed. This is particularly important in a decentralized process since deviations may have an effect in different parts of an organization of RDx. The monitoring unit must take care to check on this, and mediate any problems that occur.

C. Need for Meta-Monitoring

The meta-monitoring process must begin to operate prior to the initiation of monitoring activities. Information on the process of initiating monitoring will be needed in refining the initiation process in subsequent cycles of the development of monitoring. This must include information on problems encountered in making the initial collection and transmissions of monitoring information, as well as for evaluating procedures for deciding when sufficient building has occurred to initiate monitoring activities.

5. Step No. 4: Redesign

The discussion of the design step has so far focused on the initial design of monitoring. There are very few differences between the activities and decisions in the initial and subsequent designs of monitoring, beyond having a larger base of experience from which to work. However, some issues should be raised concerning the nature of the redesign.

A. Predesign Stage

Before beginning to redesign the monitoring process, the assumptions and predesign decisions used in the prior design must be reviewed and remade based on the experiences and learning obtained in the operation of monitoring, and the evaluation of the design done in the evaluation step. In general, the same people should participate in this predesign stage who participated in the previous predesign activities. However, experience may have indicated that other participants are required.

The predesign stage in subsequent cycles of the development process is the appropriate place to initiate changes in the approaches taken towards the long term development of monitoring. It is here that the decision will be made conderning whether the RDx monitoring process should become more or less formal. The progress of the development process should also be reviewed and decisions made as to whether it is fast enough. The readiness of monitoring to be extended into additional purposes, and the need for changes in the purposes of monitoring as a result of the maturation of or changes in RDx can be best determined here. These decisions and evaluations thus become the basis for establishing the purposes, approach and direction to be taken in the redesign of the monitoring process.

B. Design Stage

In the design stage in subsequent designs of the monitoring process, the same decisions and issues must be addressed that we discussed in the design section above. However, these must be approached in terms of two particular overall considerations.

First, each of the decisions made in the last design must be reviewed and evaluated in the light of the experiences and organizational leraning obtained during the operation of the monitoring process, and the evaluation of this process. This should not be limited to the experience within any particular organization, even if a decentralized ad hoc approach has to be taken. The experiences and results obtained in other organizations as well as the solutions to problems encountered should be taken into account. Information of this kind should be made available by the central group created to oversee the development of monitoring. The guidelines suggested in this paper should also be reviewed and, if necessary, revised.

Second, the design decisions should be revised in terms of any changes in the approach taken towards and purposes to be served by the monitoring process.

The redesign should at least involve the same design group that participated in the previous design. If a completely new group is used, it is unlikely that a full understanding of the design decisions made previously will be possible even if they were well documented. Without such understanding, much ground will have to be covered that was dealt with in the previous design stage. This represents a loss of organizational learning and will mean that the new design can't take advantage of the experiences obtained in the previous design.

VI. SUMMARY

1. Purposes of the Paper

In writing this paper, we have had two major purposes.

First, the document is seen as a basis for helping RDx personnel to conceptualize and understand RDx monitoring in its fullest sense. This, we feel, is critical since RDx monitoring is a complex process. It includes several organizations and is comprised of a great many interrelated activities which have an impact on a wide range of other RDx processes. There must be an appreciation of this complexity and an understanding of what is involved before the monitoring process can be designed and made operational.

Second, we have viewed this document as providing a basic guide to the design and operation of RDx monitoring. By raising specific issues and suggesting a way to think about these issues, we feel that the decisions about design and operation can be better structured and thus more appropriate.

We have approached these two purposes by providing a general definition of monitoring which has then been related to the specific nature and purposes of RDx. Based on this, we have developed a conceptual framework for RDx monitoring and raised several major considerations about RDx monitoring. Finally, we have discussed the design, operationalization and development over time of an RDx monitoring process.

2. Major Implications

The paper has been written in the spirit of providing several specific concepts (and a general perspective on these concepts) which can be used by RDx personnel in considering the RDx monitoring process. In developing these ideas we have used an implicit notion that there are four underlying concerns about RDx monitoring.

1) Since monitoring represents a complex phenomenon it is important to provide a general way some understanding of what it is about: some basic concepts are needed concerning what it is and what it involves.

2) This understanding must be translated into more specific ideas which can be used as a basis for designing RDx monitoring. Specific activities, processes and structures must be identified around which the design decisions can be structured by raising a range of issues and questions which must be addressed.

3) It is also necessary to provide some ideas about how monitoring operates. That is, what are the basic processes and interrelations about which any personnel, whether a designer or not, need to be aware to make it work and keep it working.

4) It is important to recognize that monitoring, like any complex organizational process must be viewed as a developmental process which emerges and changes, over time, in response to natural experimentation; changes in the context; changes in the development level of RDx and/or of the RDx monitoring process itself; or changes in the purposes of RDx or of monitoring.

These four concerns run through the discussion here and in the main body of the paper. They represent a fundamental concept of the major aspects of any approach to monitoring, and provide a general conceptual overview for RDx monitoring.

A. A Definition of Monitoring

Monitoring can be defined in terms of three basic information-related functions: collection, transmission and linkage.

Monitoring can be defined as the collection of information about some system or its environment which is used in accomplishing some set of purposes. The critical idea here is that monitoring, in any specific case, is defined in terms of the purposes it serves by providing information to decision makers. In the case of RDx, monitoring serves many purposes. It provides information needed for RDx to operate in a changing context; to orchestrate RDx activities; to facilitate organizational learning; to provide a basis for evaluation research; to facilitate the interactions among the participants in RDx; and so on.

RDx monitoring must, in general, be considered as more than the collection of information. It may not be possible that individual decision makers or organizations can collect all the information that they need. Further, the wide range of purposes served by monitoring may require that any given piece of information will be needed by more than one decision maker. Thus, it may not be an optimal strategy (in terms of the cost of collection of information and the availability of information) to consider monitoring solely as the collection of information by a particular decision maker or organization that needs it. One should consider the case in which several individuals or organizations collect information; and in which any given organization or individual uses information collected by several others.

Therefore, monitoring must also be considered as involving the transmission of information from those who collect it to those who need it. Transmission requires that a way exists to identify who needs a given piece of information so that it can be specifically transmitted -- without having to transmit all information collected to all possible users. This implies, as well, that a way exists to allow the decision makers within RDx participant organizations to influence what information is collected, so that the information collected is most useful. These two issues involve what we refer to as a linking function: linking the collection of information to its use. It is analogous to the functions performed by RDx itself in dissemination and feed forward.

Thus, monitoring can be seen as being comprised of three functions: collection, transmission, and linking. For monitoring to be designed and operated effectively, it must be understood that these three functions are all necessary, and that they interact: they must be integrated into the overall monitoring process.

RDx monitoring provides information about specific aspects of RDx itself and the educational R&D context within which it operates. It is analogous to the reading of dials or gauges on a machine which provides information about critical aspects of that machine. In monitoring these dials are replaced by indicators: specific, identifiable, and measureable factors which reflect critical aspects of the process and activities in RDx or its environment. The indicators to be used in RDx monitoring must be chosen in terms of a determination of the purposes which monitoring in RDx will serve and those aspects of RDx or its context about which information is needed for those purposes.

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*This is not meant to imply that RDx, education or educational R&D is in any sense machine-like in character.

This conceptual definition provides a basis for thinking about the range of activities involved in monitoring and its purpose in RDx. This is necessary before monitoring can be designed and operated.

B. A Framework for RDx Monitoring

As we have defined it, RDx monitoring is a complex process. Information may be collected and used by a number of people or organizations for a number of purposes. This complexity makes it difficult to design and operate monitoring without a framework which can be used to differentiate monitoring activities into categories. Rather than attempting to approach monitoring in terms of specific activities one can (at least as a starting point) think of monitoring activities, and the interrelationships among them, in terms of these categories. Further, a framework of this type would allow one to develop an overview or "map" of RDx monitoring, which is needed in designing and operating a process as complex as RDx monitoring.

Such a framework can be constructed for RDx monitoring in terms of four dimensions. Each dimension provides a basis for differentiating monitoring activities.

a. Types of Information

The various purposes which might be served by RDx monitoring require different types of information. This information can be broken down into five classes:

1) the activities being performed in RDx at some point in time;

2) the activities being performed in the overall educational R&D process at some point in time;

3) the results of RDx activities;

4) the results of educational R&D activities;

5) the nature of the interactions among RDx participants, and between RDx participants and organizations in the R&D system.

Monitoring activities can be differentiated in terms of the type of information collected; in other words, the aspect of RDx on which a given monitoring activity focuses.

b. Time Orientations

Monitoring activities can also be differentiated on the basis of the time frame which underlies the intended use of the information collected. Current Needs Information refers to that information intended for use in current, operational RDx activities. Future Needs Information refers to that information required at some later point in time as an input to RDx activities and for more general activities such as evaluation or policy making which will require historical background as an input. Future needs information would be placed in memory until it is needed.

c. Location of Collection Activities

Another way to differentiate monitoring activities is on the basis of where in RDx they are conducted. In other words, by which RDx organization (or group of organizations) is a particular piece of information collected.

d. Location of Needs for Information

Monitoring activities can be differentiated in terms of where in RDx a given piece of information is needed as an input to decision making -- i.e., which organization or group of organizations requires a given piece of information as an input to their own activities.

Taken together, these four dimensions allow one to specify a wide range of categories of monitoring activities. By noting that these four dimensions fully interact with each other, one can identify the relationships among these categories. This makes it possible to construct a conceptual overview or map of the RDx monitoring process which locates what information is collected, who could collect it and who would need it.

The design process thus locates specific monitoring activities within the framework which, given how the framework is constructed, locates them within RDx itself. When this has been done, one has a blueprint for RDx monitoring. This blueprint can be used to construct the monitoring process. It identifies those participant organizations which must develop the capabilities for monitoring, where communication channels must be developed among RDx participants. It provides a mechanism for the linking function.

This blueprint also serves to help RDx participants operate within the monitoring process. It locates for them where information is collected, where they can go to get a given piece of information and, if a needed piece of information is not currently being collected, where in RDx it would be easiest to have it collected.

C. Other Considerations

The nature of the RDx monitoring process raises several other issues. These issues can influence the effectiveness of monitoring and its ultimate usefulness to RDx. Therefore, they should be taken into consideration in the design and operation of RDx monitoring.

A major consideration concerns when a specific indicator is actually monitored. It is not the case that one would monitor all indicators at all times. It is important to consider how often an indicator is monitored, and under what conditions it should be monitored. Some indicators are relevant only at specific stages of a given RDx activity. Others are relevant only in early or later stages of the development of RDx itself. Collecting information when it is not directly relevant to some purpose not only results in wasted resources but can provide misleading information which results in poor decision making.

As we have said, RDx monitoring may involve the exchange or sharing of information across organizations. There are several potential barriers to this which range from a reluctance to share sensitive information about one's own activities to a fear of information being used to establish power bases within RDx. A system of incentives are needed to overcome these barriers.

Such incentives can be provided in two related ways. First, direct action is needed to remove barriers by such mechanisms as insuring confidentiality. Second, direct incentives can be provided by building a high level of commitment to overall RDx goals, and by demonstrating that the sharing of information is necessary for achieving these goals. This can be accomplished by, in effect, marketing the RDx monitoring process and demonstrating or explaining its importance to RDx as a whole.

A final consideration concerns the need to monitor the monitoring process itself to insure that monitoring takes place, and to evaluate and redirect monitoring within RDx. This is referred to as meta-monitoring. This requires that indicators be established to provide information about monitoring. The overall monitoring framework provides a major input to this by identifying those monitoring activities which should be monitored and locating where they take place.

One must address the issue of who should conduct meta-monitoring activities. These activities may be performed by any participant in RDx. It is important to recognize that if only a single participant or small group of participants is involved, meta-monitoring may be perceived as a threat to other participants.

D. Development

In considering the RDx monitoring process, it is important to recognize that it cannot be created in a short time. The monitoring process must emerge over a series of stages in which critical design decisions are made and implemented, and in which the skills and interorganizational communication channels required by monitoring can be developed.

Indicators must be suggested and tested at an early stage of development and refined over time. This requires that an extensive analysis be done concerning possible needs for information. Organizations must analyze their existing personnel to establish if these people have the skills needed for monitoring. They must staff their monitoring activities based on available skills or by hiring additional personnel. They must also establish organizational units to carry out the range of monitoring activities they are to perform. Guidelines must be established which can be used by participants in the development and operation of RDx monitoring. These guidelines should cover the range of issues we have discussed above such as when information should be collected, and who should collect it. While it is possible to suggest tentative guidelines, as we have in the main paper, these must be developed and refined on the basis of the experiences of RDx.

3. Conclusion

The monitoring paper can be used to provide several specific reference points in approaching RDx monitoring. The issues raised and the suggestions made can allow one to begin thinking about monitoring in its fullest sense. By providing a basis and direction for such thinking, and for discussions among individuals associated with RDx, a fundamental understanding of the nature and purpose of RDx monitoring can be achieved. This understanding, taken with the more specific concepts in the paper can provide a basis for structuring the design decisions which must be made for RDx monitoring. This understanding and the issues raised are relevant to others in RDx who, although they may not participate in the design of RDx monitoring, will be involved in its operation. Finally, this understanding and these issues are relevant to determining how monitoring is to develop over time and in response to changing purposes and needs. This paper cannot serve to provide final answers to the issues raised. This must come from many sources.

We have only attempted to define the domain of problems and to suggest how to identify the questions. The final answers must take into account the experiences of other systems which have done this, those of members of RDx and ultimately the experiences of RDx itself in a process of ongoing learning. This requires that RDx take an experimental approach to developing monitoring. This paper can be used to determine the questions which need to be asked.

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CHAPTER TEN

THE R&D EXCHANGE:
AN EMERGING EFFORT

March 1978

This paper reflects the contributions of numerous R&D Exchange participants. The initial draft was developed by an RDx work group in July 1977 and has been revised several times as a result of written comments and group discussions. This latest version has been approved by the RDx Executive Committee and the RDx Advisory Group.

INTRODUCTION

The Research and Development Exchange (RDx) is an emerging federal effort to bring the worlds of educational research and school practice closer together. It is operated by a consortium of regional educational laboratories and a university-based r&d center. Activities are funded through the School Practice and Service Division, Dissemination and Resources Group, National Institute of Education.

The purpose of the RDx is reflected in its name: to create an exchange of information. Researchers and developers communicate the results of their work to educational practitioners. Simultaneously, the practitioners use the RDx to relay information about their needs to researchers, developers, and policymakers. Thus the RDx encourages practitioners to influence future r&d policies and programs while it informs them about available r&d outcomes.

Currently, the R&D Exchange consists of four central services and five regional exchanges working through 36 cooperating state departments of education (see page 12). Plans are underway, however, for the initiation of additional regional exchanges so that states not currently involved can participate.

Regional exchanges operate in defined regions of the country. Activities are carried out primarily through intermediate linkages affiliated with state departments of education. That is, each cooperating state department has one or more contact persons. Local educators, then, call on these linkers when in need of resources. The linkers, in turn, refer questions or requests as necessary to the regional exchanges. In some states, regional exchanges also work with other relevant agencies in a similar manner.

Supporting the regional exchanges in their efforts to serve educational practitioners are four central services.

The central services, regional exchanges, and others participating in the R&D Exchange are described in the final section of this paper.

The primary purpose of the paper, however, is to define the initial operating parameters of the R&D Exchange. It also is intended to facilitate discussion among RDx participants, the National Institute of Education (NIE) staff, and others, and will be revised and refined as discussion and experience dictates.

The paper touches on a variety of topics of continuing concern: the general problems toward which the RDx effort is directed, understandings affecting the design of the work, specific problems being addressed by the RDx goals and objectives, principles guiding the work, and examples of current activities.

GENERAL PROBLEMS

In the 1950s and 1960s the federal government began to increase significantly its funding of educational innovations and improvement and as part of this effort, its funding of educational research and development. In authorizing the National Institute of Education in 1972 as the primary agency for the support of educational research and development, the Congress made clear its expectation that NIE should both support research and development responsive to needs of educational practitioners and carry out dissemination/utilization activities to insure that practitioners benefit from the results of educational research and development.

Because of its dual mission, NIE is concerned with (1) the extent to which educational r&d outcomes are being effectively disseminated and, more importantly, how such outcomes are affecting educational practice; and (2) the extent to which the r&d community is responding to the needs and problems of educational practice.

With regard to the first concern, educational practice seems to be affected primarily in three ways by educational r&d: (1) classrooms, schools, and school districts are directly involved in specific educational r&d projects; (2) through formal and informal networks, teachers and administrators learn about, adopt, and/or adapt concepts and practices resulting from r&d projects; and (3) schools and school districts purchase (and adopt or adapt) materials which have resulted from r&d projects and which are now being published and actively marketed by commercial firms. From NIE's perspective, these ways do not insure maximal use of r&d outcomes. Therefore, other ways to disseminate and encourage the use of r&d outcomes are being explored.

With regard to the second concern, NIE recognizes that many factors influence the kinds of research and development activities now in progress. These include the intellectual background of researchers, their experience with educational practice, incentives provided to researchers by their colleagues and institutions, and perhaps most importantly, the policies and procedures of r&d funding agencies. These and other factors raise questions about the extent to which current r&d is truly responsive to practitioner needs. Therefore, it is necessary to explore new ways of identifying the needs of educational practitioners and bringing these needs to the attention of researchers, developers, and funding agencies.

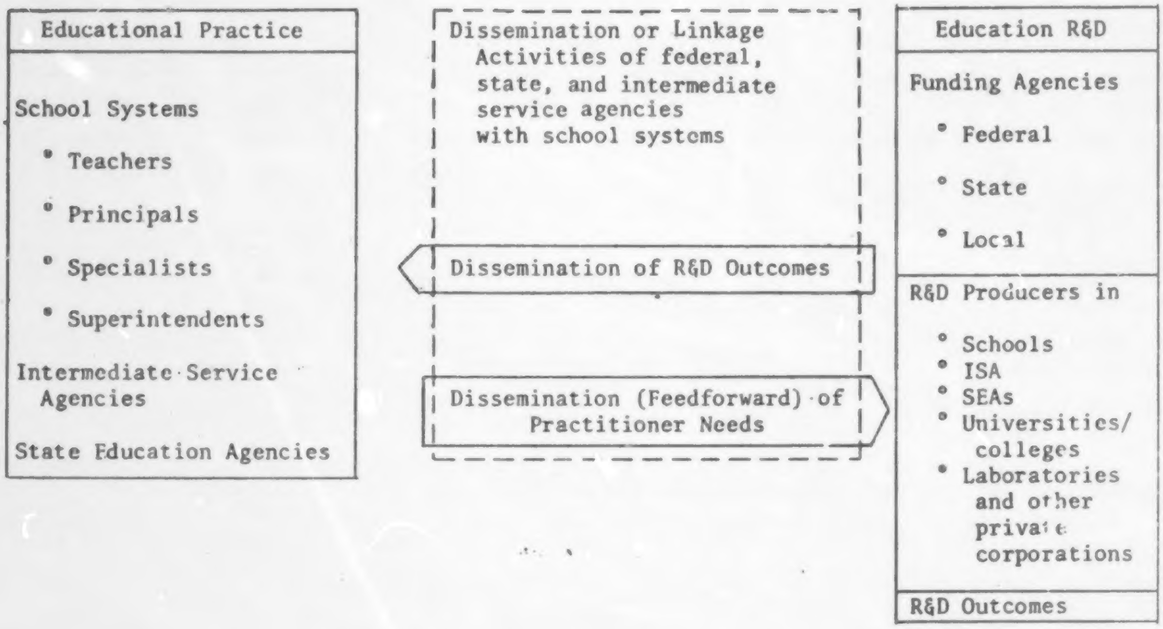
In order to initiate such activities, in the fall of 1976 the NIE Dissemination and Resources Group launched a collaborative planning effort involving representatives from some educational laboratories, r&d centers, state educational agencies, intermediate agencies, and USOE regional offices. The purpose of the planning effort was to explore ways to bring educational r&d results to practitioners (K-12) and to return (feedforward) information about practitioners' needs and concerns to educational researchers, developers, and their sponsors. This effort has come to be called the Research and Development Exchange (RDx).

DEVELOPING UNDERSTANDINGS

In the course of the planning effort, certain understandings developed regarding the nature of the educational enterprise. These understandings helped define the goals, determine the operating principles, and shape the initial activities of the RDx. Figure 1 presents a framework for discussing some of these understandings.

Figure 1

Framework for Developing Understandings


Educational Practice
School Systems
• Teachers
• Principals
• Specialists
• Superintendents
Intermediate Service Agencies
State Education Agencies
Dissemination or Linkage Activities of federal, state, and intermediate service agencies with school systems
Dissemination of R&D Outcomes
Dissemination (Feedforward) of Practitioner Needs
Education R&D
Funding Agencies
• Federal
• State
• Local
R&D Producers in
• Schools
• ISA
• SEAs
• Universities/colleges
• Laboratories and other private corporations
R&D Outcomes

On one side of the figure is the world of educational practice: those directly involved in the design and delivery of educational programs and in the management and maintenance of educational institutions. On the other side is educational r&d: the agencies which fund educational r&d, researchers and developers, and outcomes of r&d. The two major concerns described in the first section of this paper are reflected by the two arrows: how best to disseminate* r&d outcomes to educational practitioners and how best to "feedforward" information about practitioner needs and experiences to researchers, developers, and r&d funding agencies. A wide variety of dissemination organizations and individuals are performing activities directly or indirectly related to these two concerns. These groups are represented in the center portion of the figure.

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* The term "dissemination" and other key terms are defined in Appendix A.

Educational Practice

Educational practice is a complex enterprise which encompasses 50 states, 17,000 school districts, 106,000 schools, and many supporting institutions. It involves thousands of professionals who serve millions of students. The practitioners of particular interest to the RDx are those teachers, principals, curriculum supervisors, district administrators, school boards, and state and intermediate educational agency personnel who participate in determining the purposes of education; designing educational programs and policies, and creating and maintaining the organizations that deliver those programs and implement the policies.

Practitioners are decentralized to many settings--each of which, whether classroom, school, district, or state department--operates with a sense of autonomy. Each setting, in part, represents distinct interests and needs. Thus the practitioner community is pluralistic in nature.

Another characteristic of education, due in part to its decentralized, pluralistic nature, is that change tends to occur individualistically and incrementally. For example, changes are regularly made in instructional materials, in instructional methods, in schedules, or in organizational arrangements. However, these changes generally occur one at a time; they rarely are initiated in a comprehensive, integrated way. Further, the new materials or processes are, of course, intergrated with existing available resources and adapted to fit user constraints.

Educational R&D

Educational r&d is also a complex enterprise consisting of r&d funding agencies, r&d producers, and r&d outcomes themselves.

R&D funding agencies. Although educational r&d work is funded by all levels of the educational system and by the private sector, the primary sponsor is the federal government. By the government's own analyses, seven major agencies within the Department of Health, Education, and Welfare (DHEW) fund educational r&d. In addition, nine agencies related to departments other than DHEW are also involved in funding some educational r&d.* Considering the number of bureaus, divisions, branches, and programs found in this collection of agencies and the variety of legislation authorizing this work, it is reasonable to assume that the current funding of educational r&d is dispersed and is guided by a very diverse set of policies and procedures.

R&D producers. R&D producers are a subset of a broader community of individuals, groups and organizations which are involved in efforts to improve educational practice. In theory, what distinguishes r&d producers is their effort to understand educational practice, to build theories and conceptual models based on those understandings, to develop practices based on those theories and models, to subject those theories, models, and practices to tests, and to make revisions in accordance with test results. R&D producers are found in many settings--in school systems, intermediate service agencies, state education agencies, federal agencies, universities and colleges, r&d centers, regional laboratories, and a variety of other private corporations.

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*National Institute of Education, 1976 Databook: The Status of Education Research and Development in the United States, (Washington, D.C.: Government Printing Office, 1976).

R&D outcomes. For the purposes of this paper r&d outcomes are defined as those products, skills, programs, instruments, teaching and management methods and techniques, and concepts that are produced by disciplined inquiry involving activities normally considered part of the r&d process, such as conceptualizing, hypothesizing, developing models, field testing, data gathering and analyzing, and evaluating.

The RDx effort is concerned with the following related r&d outcomes: (1) the findings of specific studies; (2) concepts, as well as generalizations involving those concepts, which structure current perception and summarize current understanding; (3) educational practices which operationalize current understanding in specific settings, including locally developed r&d-based practices; and (4) products and processes which help others adopt, adapt, and implement specific r&d-based practices. These outcomes relate to one another in the following way: concepts and understandings guide the design of studies and the development of practices; the findings of studies modify current understandings; products are derived from developed practices; the use of products results in the spread of specific practices; and widespread practices provide settings for new studies. Therefore, disseminating r&d outcomes actually involves disseminating a complex of interrelated outcomes.

Dissemination, or Linkage, Activities

The discussion thus far describes understandings and assumptions related to the two sides of Figure 1--the educational practice and the educational r&d communities. The function represented by the two arrows will now be considered --that is, dissemination of r&d outcomes and feedforward of practitioner needs, concerns, and findings.

Dissemination of r&d outcomes. At present there is no single, comprehensive system for disseminating r&d outcomes to educational practitioners and there appears to be a consensus that such a system would be undesirable. Instead, the 1977 Dissemination Forum, attended by individuals from all levels of the educational community, called for the development of a "nationwide dissemination configuration" (see Appendix B). Some existing elements of this configuration are described briefly below.

- The Educational Resources Information Center (ERIC) indexes and stores, among other documents, articles and reports of research conducted, understandings developed, and practices tried.

- Many efforts are underway to identify "effective" practices developed through r&d activities. For example, the Joint Dissemination Review Panel (JDRP)* is identifying such priorities developed using federal monies. The National Diffusion Network is then helping practitioners become aware of some of these practices and consider them for adoption and implementation. Some state education agencies are developing similar review and diffusion systems.

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* The JDRP is an NIE-USOE panel which reviews evidence of effectiveness of educational products and practices developed with federal funds. Approval by the panel makes a product or practice eligible for widespread dissemination by NIE or USOE.

- State education agencies, intermediate services agencies, and some universities and large school systems are developing resource centers and staff capability to help practitioners define their information needs, to do information searches for practitioners, and to help practitioners to use the information obtained.
- Special projects (e.g., NIE's R&D Utilization projects) are exploring procedures for helping practitioners with specific problems (student performance in the areas of basic skills or career preparation) to consider alternative r&d outcomes and select and use those that can assist them in solving problems.

These examples indicate that the developing nationwide dissemination configuration includes multiple functions and actors. As such it reflects the pluralistic nature of the educational community it serves. The RDx is one part of this developing configuration with major emphasis on interaction between regional laboratories and state education agencies to meet state and regional needs.

Feedforward of practitioner needs. Currently, the educational practice community uses primarily political means to influence r&d funding agencies and producers. This influence takes the form of a network of interest groups--for example, the Council of Chief State School Officers, the government liaison offices of universities and colleges, professional associations and unions, and special purpose groups related to specific government programs like CEDaR, NDN, or the ERIC Clearinghouses. These groups regularly present their points of view directly to the staff of federal agencies and to the Congress. In addition, they seek to have their points of view represented in agency advisory groups and proposal review groups. Thus, if there is a system for "feeding-forward" information about educational practice which influences the work of educational researchers and developers, it is embodied at least to some degree in legislative mandates, agency policies and regulations, and requests for proposals of the federal government.

In addition, some information regarding the interests and needs of educational practitioners is provided by the r&d community through surveys, evaluation studies, and policy analyses. Regional laboratories have collected such information from states to determine regional r&d and service needs. However, most analyses of educational need have tended to focus on targeted problem areas. Only rarely have the broad needs of education been assessed. And there has certainly been little systemmatic effort to collect or synthesize information about practitioner needs in order to influence federal r&d priorities.

GOALS

The understandings about the nature of the education environment described in Figure 1 suggest three concerns that need to be addressed: (1) how can understanding and use of r&d outcomes be increased in order to better meet practitioner needs; (2) how can r&d outcomes better reflect practitioner needs, concerns, findings; and (3) how can the quality and efficiency of organizations and personnel involved in linking r&d outcomes with practitioner needs by improved? Through its three major goals, the RDx is attempting to respond to these concerns. The goals are described below.

1. There are increasing numbers of organizations and personnel involved in carrying out dissemination activities aimed at improving educational practice. Therefore, a major goal of the RDx is: To develop with these organizations and personnel ways of coordinating dissemination activities and resources.

    1.1 Share information about alternative dissemination strategies.

    1.2 Share human and material resources to strengthen the capacity of these organizations and personnel to carry out dissemination.

2. There are increasing numbers of r&d outcomes which can be used in efforts to improve educational practice. Therefore, a second major goal of the RDx is: To increase understanding and use of r&d outcomes by organizations and personnel who work with practitioners.

    2.1 Provide consumer-oriented information that facilitates comparison of r&d outcomes to meet specific needs.

    2.2 Provide assistance in the use of information about r&d outcomes.

    2.3 Make r&d outcomes more accessible.

3. There are diverse organizations and personnel involved in the conduct of r&d to improve educational practice. Therefore, a third major goal of the RDx is: To increase shared understanding and application of information about practitioner needs and efforts to meet those needs.

    3.1 Provide information about practitioners' needs and current activities to help the r&d community make decisions about the production and delivery of r&d outcomes.

    3.2 Provide information about the dissemination and use of r&d outcomes.

    3.3 Help the r&d community explore the implications of information about practitioners' needs and apply this information to their work.

These goals are concerned with the central portion of Figure 1. That is, they are concerned with improving the linkage or dissemination functions of individuals and organizations whose primary responsibility is to facilitate a two-way flow between the r&d and practice communities. Such individuals may also act as liaisons within the dissemination community. They may, of course, be employed by either the r&d or the practice community. For example, such a person could be a dissemination specialist for an r&d laboratory or a staff development specialist for a school district. Marketers for commercial publishing firms can also serve this function.

Operating principles that are used to guide the RDx in implementing these goals are described in the next section. Then, sample activities related to each goal are presented.

OPERATING PRINCIPLES

After arriving at common understandings about the nature of the educational enterprise and defining goals based on those understandings, the RDx planning group adopted certain operating principles to guide its activities. These principles define both what the RDx is and what it is not. They are discussed below.

1. The RDx plans and conducts its activities in a collaborative way. The regional exchanges work with cooperating state education agencies, and other relevant agencies and associations, to define and implement dissemination, feedforward, and linkage activities. The central services work to support these regional efforts to meet the needs of state educators. Thus the RDx encourages exchanges both between regional laboratories and state agencies and among participating r&d institutions (labs and centers). It also promotes exchanges among r&d and dissemination staff within the participating institutions. Thus the RDx attempts to build on existing organizations, activities, and functions.

2. The RDx effort is developmental. The needs of educational practitioners are diverse and changing. Therefore, RDx contractors, together and separately, do not start with fixed notions of problems and potential solutions. Instead, they work through cycles of analyzing current situations, defining problems, and designing and testing alternative strategies and solutions. Thus the RDx does not advocate singular strategies nor does it advocate particular r&d outcomes as solutions.

3. The RDx is a coordinated effort. That is, the regional exchanges and central services work together to explore ways of organizing the work to insure optimum use of available resources. For example, some information about r&d outcomes is best provided through a centralized mechanism. Knowledge synthesis falls in this category. However, to meet diverse needs of practitioners, such information is disseminated and used on a decentralized basis. Thus RDx participants work together to determine which arrangements best meet the criteria of effectiveness and efficiency. They do not act as separate, independent contractors.

4. Due to funding and other resource constraints, the RDx is initially concentrating its central service efforts on the priority areas of basic skills (math and reading/language arts) and competency-based education. These priorities were identified as areas of need through regionally conducted assessments. As needs change and/or as additional resources become available, RDx priorities will change and expand. Thus the RDx will not become a specialized effort dealing only with the current priorities but will be concerned with a range of r&d outcomes.

5. The RDx will work to ensure equity. The contractors will provide for full employment opportunities for women and minorities and will promote social fairness in all RDx activities.

These operating principles, like the RDx goals, are an outgrowth of the understandings about the nature of the education environment described in Figure 1. Thus the understandings, goals, and principles together shape RDx activities. Some sample activities are presented in the next section of the paper.

SAMPLE ACTIVITIES OF R&D EXCHANGE

KEY: Rx = Regional Exchange
RDIS = R&D Interpretation Service
RRS = Resource and Referral Service
LTS = Linkage Training Service
SSS = System Support Service

Goal 1: Develop with organizations and personnel involved in carrying out dissemination activities ways of coordinating dissemination activities and resources.

● Identify regional and extra-regional r&d information systems of potential use to state and intermediate linkers.	All Rxs
● Obtain and compile comprehensive information about resource organizations and personnel in those organizations which will help regional exchanges.	RRS
● Provide service to regional exchanges in the form of:	RRS
-- Information about available resource organizations and personnel in those organizations.	
-- Recommendations on suitable resources for specific problems.	
-- Assistance in making contacts with appropriate organizations and personnel.	
● Develop and implement a process for identifying linkage training and support needs.	LTS
● Identify linkage training support needs in each region.	All Rxs
● Develop a conceptual framework for linkage training.	LTS
● Revise and expand "Sourcebook" of linker training materials	LTS
● Produce an inventory of human resources for dissemination training and consultation.	LTS
● Design and conduct model training programs to meet linkage training needs.	LTS, All Rxs
● Assist regional exchange users in the analysis or evaluation of existing dissemination programs and activities	SEDL, AEL, CEMREL, & NWREL Rxs
● Assist regional exchange users in conducting their own needs assessments and in examining alternative models and strategies for decision making by SEAs, ISAs, and LEAs.	SEDL, AEL, & NWREL Rxs

Goal 2: Increase understanding and use of r&d outcomes by organizations and personnel who work with practitioners.

• Identify materials and information systems which provide information on alternative educational programs and products.	RDIS, RRS
• Develop model products which pull together information on r&d outcomes and product alternatives in RDx priority areas.	RDIS, SSS
• Collect and prepare selected r&d consumer information materials to meet high priority needs of regional users.	All Rxs
• Distribute consumer information materials to personnel with dissemination functions within the region through mailings and regular personal visits both proactively and in response to individual requests.	All Rxs
• Identify products described in NIE Catalog which are not available.	SSS
• Establish and maintain a small-scale regional collection of r&d products in RDx priority areas.	AEL & NWREL Rxs

Goal 3: Increase shared understanding and application of information about practitioner needs among organizations and personnel involved in the conduct of educational r&d.

• Develop conceptual framework, and design and implement procedures for collecting and aggregating information about practitioner needs.	SSS
• Collect data on regional educational needs identified by SEAs from statewide needs assessments or information requests from state, intermediate, and local linkers.	All Rxs
• Synthesize data on regional educational needs, and report to the System Support Service, NIE, and other relevant groups.	All Rxs
• Synthesize regional data from various regional exchanges and recommend priorities for RDx.	SSS
• Collect information about the extent of use, and the usability of, r&d products in the region and forward to the System Support Service.	SEDL & AEL Rxs
• Develop a r&d product tracking system and maintain a system-wide file of information concerning NIE and non-NIE r&d outcomes in high priority problem areas.	SSS

STRUCTURE AND FUNDING OF THE R&D EXCHANGE

Figure 2 is an operational chart of the current R&D Exchange. Each of the regional exchanges is designated by a solid line. In addition, emerging regional exchanges are indicated by a broken line. Also included in the figure are the four central services, the Executive Committee, the Advisory Group, and the funding agency.

Regional Exchanges

Each of the current regional exchanges is listed below. Indicated are the names of the host laboratories and the state departments of education with which they are affiliated. Emerging regional exchanges include the Mid-continent Regional Educational Laboratory, Kansas City, Missouri, currently participating as part of the Midwest Regional Exchange, and SWRL Educational Research and Development, Los Alamitos, California. The regions of these potential regional exchanges are not yet defined.

Appalachia Educational Laboratory
Charleston, West Virginia

Alabama
Florida
Kentucky
Mississippi
North Carolina
South Carolina
Tennessee
Virginia
West Virginia

CEMREL, Inc.
St. Louis, Missouri
With Mid-continent Regional Educational Laboratory, Kansas City, Missouri

Illinois
Indiana
Iowa
Kansas
Michigan
Minnesota
Missouri
Nebraska
Ohio
Wisconsin

Northwest Regional Educational Laboratory
Portland, Oregon

Alaska
Colorado
Hawaii
Idaho
Montana
Oregon
Utah
Washington

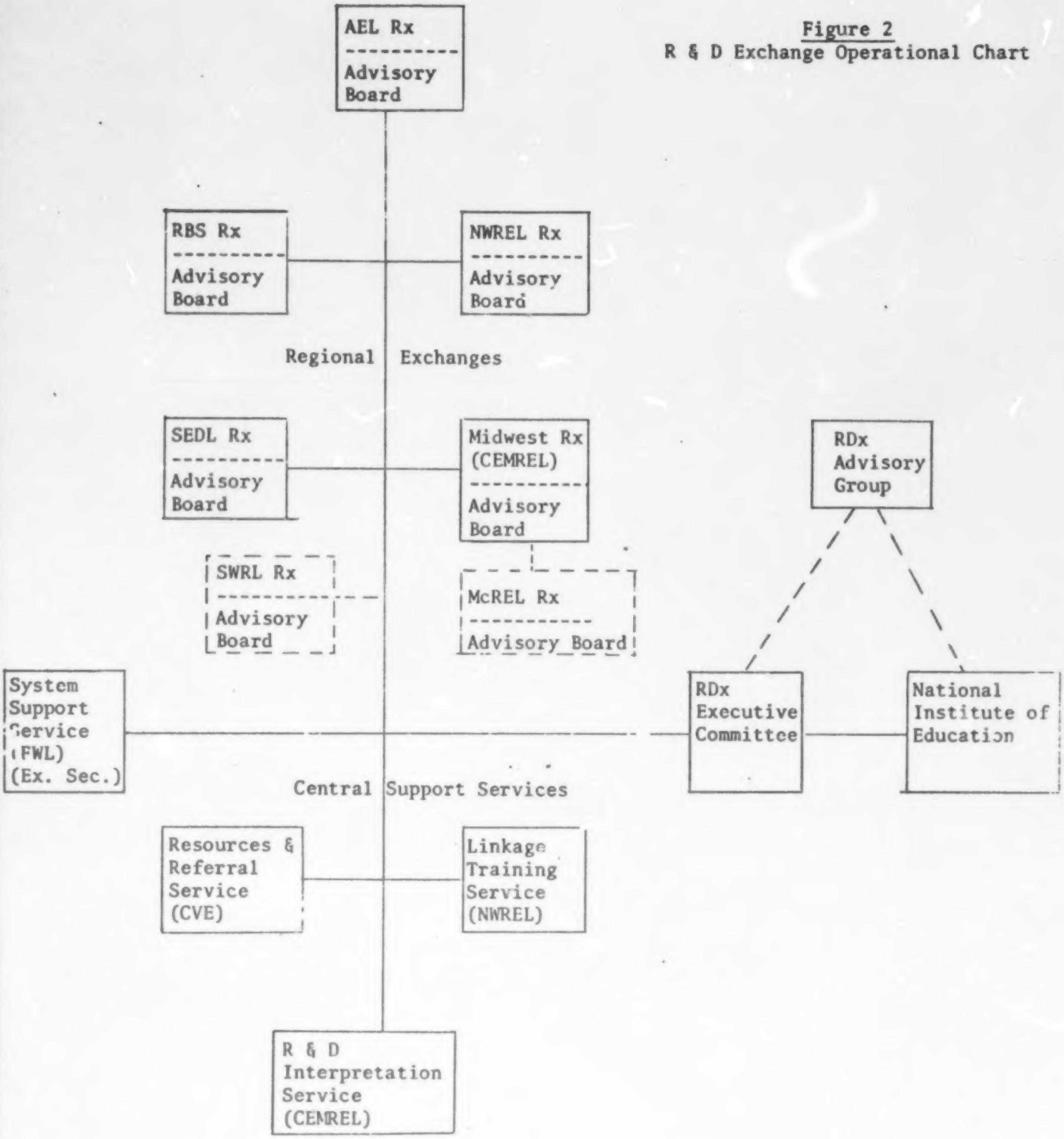
Research for Better Schools, Inc.
Philadelphia, Pennsylvania

Delaware
Maryland
New Jersey
Pennsylvania

Southwest Educational Development Laboratory
Austin, Texas

Arkansas
Louisiana
New Mexico
Oklahoma
Texas

Figure 2
R & D Exchange Operational Chart


AEL Rx
Advisory Board
RBS Rx
Advisory Board
NWREL Rx
Advisory Board
Regional Exchanges
SEDL Rx
Advisory Board
Midwest Rx (CEMREL)
Advisory Board
SWRL Rx
Advisory Board
McREL Rx
Advisory Board
RDx Advisory Group
System Support Service (FWL) (Ex. Sec.)
RDx Executive Committee
National Institute of Education
Central Support Services
Resources & Referral Service (CVE)
Linkage Training Service (NWREL)
R & D Interpretation Service (CEMREL)

Central Services

Four central services support the regional exchanges in their efforts to serve state educators. The services are described below.

- A Linkage Training Service provides training, consultation on training, and other related support for individuals responsible for dissemination activities in their state, service area, or school district. This support is provided by the Northwest Regional Educational Laboratory.

- An R&D Interpretations Service is experimenting with transforming r&d-based knowledge, initially in the basic skills areas, into forms that can be used more readily by educational practitioners. This includes identifying existing interpretive literature. The intent is to provide information that will help educators make choices among an array of materials and practices. This service is provided by CEMREL, Inc.

- A Resource and Referral Service is building a data bank of available information resources. Included will be data about organizations and people who produce, are knowledgeable about, or disseminate r&d outcomes in the basic skills and competency-based education areas. This service is located at the Center for Vocational Education, Ohio State University.

- A System Support Service facilitates the operation of the total R&D Exchange, including coordinating the efforts to inform the r&d community of practitioners' reactions and needs. This service is provided by the Far West Laboratory for Educational Research and Development, San Francisco.

Additional Activities

In addition to performing the types of activities already described, the RDx contractors, together with NIE, have additional management and coordination responsibilities. Some of these are carried out by individual contractors working with NIE monitors, while others are coordinated through the RDx Executive Committee which includes a representative from each contractor. The functions of the Executive Committee are defined in a separate paper that is available upon request. Likewise, a separate paper defines the functions of the Advisory Group, which meets two or three times a year to provide the RDx with advice on policies and priorities.

RDx Funding

The R&D Exchange is funded by the National Institute of Education with monies which come from the part of the NIE budget allocated for the sole support of regional educational laboratories and university-based r&d centers.

Current RDx contractors were chosen as the result of a competition. The initial planning period ran from October 1976 through February 1977. Planning continued during the subsequent nine months, March through November 1977. During this time feasibility testing of activities was also conducted. The current funding period extends through May 1978. After that, R&D Exchange activities will be included as part of the overall, institutional scopes-of-work of laboratories and centers.

APPENDIX A

KEY TERMS

Consumer information: analystic, interpretive information on multiple r&d based outcomes such as EPIE product reports, interpretations of research findings for teachers, etc.

Dissemination: A knowledge-transfer process which may consist of four levels of activities:*

Level 1 Spread: The one-way casting out of knowledge in all its forms: information, products, ideas, and materials, "as though sowing seeds."

Level 2 Exchange: The two-way or multi-way flow of information, products, ideas, and materials as to needs, problems, and potential solutions.

Level 3 Choice: The facilitation of rational consideration and selection among those ideas, materials and outcomes of research and development, effective educational practices and other knowledge that can be used for the improvement of education.

Level 4 Implementation: The facilitation of adoption, installation, and the ongoing utilization of improvements.

Exemplary Practice: A new or outstanding practice developed in a local education setting. A practice is exemplary to the degree it meets five criteria: (1) is viewed by practitioners as needed and worth initiating; (2) is successful/effective; (3) is exportable; (4) is reasonable in cost, time, and personnel required for implementation; and (5) has been systematically documented.

Feedforward: the process of communicating educational practitioner (and linker) needs for, or reactions to, r&d outcomes to the r&d community (sponsors, performers, trainers, etc.) with the intent of either (a) influencing the character and responsiveness of future r&d activity (including production and delivery) or (b) of providing evidence regarding the impact on or benefit of current and past r&d activity.

Feedforward activity: activities such as data collection, data synthesis and data reporting that focus on channeling user needs and user experiences with r&d outcomes to knowledge producers and educational decision-makers.

Knowledge transformation/analytical and interpretative product: a process of translating/interpreting r&d outcomes in terms of essential practices and conditions that can lead to replication and/or adaptation by practitioners. The drawing of implications for practitioners is embedded in the definition.

Linkage: the establishing and maintenance of effective channels of communication between practitioners in schools and various knowledge-producing agencies.

Linkage system: the agencies--such as universities, publishers, RIEs, State Departments, intermediate service agencies, LEAs--who collaborate to provide a link between the practitioner and r&d products.

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*Adopted from the Report of the Dissemination Analysis Group to the Dissemination Policy Council, Office of the Assistant Secretary for Education, HEW.

Linkage support system: agencies--such as labs, centers, regional exchanges--which provide consultation, training, and the accessing of human and material resources to facilitate the operation of the linkage system.

Linking agents or linkers: individuals who help others engage in problem-solving by connecting them with appropriate knowledge, materials, and human resources and who help them in the use of these resources.

R&D outcome: the result of the r&d process. It may be a product, a model, a policy finding, or a research result. What sets r&d outcomes apart from other knowledge is that they are tested in the field on the relevant population and then adjusted accordingly.

R&D product: a tangible, transportable, self-contained outcome of the process. The r&d process involves a sequence of activities rooted in the scientific method in which research findings or relevant theory is translated into usable artifacts. The translation is then subject to evaluation and revision to ensure that the product(s) meets the needs for which it was designed.

R&D resource: resources are of two types: materials and human. Material resources include organizations and information products. Human resources include personnel who produce, are knowledgeable about, or disseminate r&d outcomes which would be useful to the RDx. Both material and human resources reflect the approach of systematic, disciplined inquire to educational problem-solving.

R&D tracking: the process of determining patterns and locations of r&d outcome utilization and impact within the educational community.

Technical assistance: provision of support to participant groups for the purposes of solving problems in planning, implementation and evaluation of dissemination plans, of providing or brokering training in dissemination skills, of providing access to information about r&d outcomes and resources.

Thin-market materials: r&d products, programs or practices that are designed for a small yet specific segment of the educational community, which are unsuited to a mass-market commercial distribution, and expensive to install and/or maintain on a per-student basis.

APPENDIX B

STATEMENT OF AGREEMENT BY PROFESSIONALS IN THE FIELD OF EDUCATIONAL DISSEMINATION AT THE JUNE 1977 DISSEMINATION FORUM

Continuous efforts are required to maintain and improve educational practice so that all Americans have the opportunity to learn in accordance with their need. Research, development, evaluation, and dissemination of effective practice are vital to the achievement of this goal.

At the current time a number of agencies, organizations, programs, and systems are working in the area of dissemination. These existing efforts are making significant headway in providing support for educational improvement and should be encouraged to continue.

At the same time it is believed that the results of these efforts will be significantly improved if they can be incorporated into a Nationwide Dissemination Configuration.* The development of such a configuration can help to alleviate the problems identified by recent analyses and assist the Office of Education, the National Institute of Education, and other elements in the Education Division of HEW in meeting congressional mandates related to dissemination.

The deliberate development of such a nationwide configuration, over time, can also help educators better understand the array of resources available to help them improve the educational system. The undertaking of such a nationwide effort is important; no single agency or group of agencies could or should develop a nationalized system nor could they acquire and manage all the necessary resources.

To promote the development of such a Nationwide Dissemination Configuration, a group of professionals** working in the area of dissemination met in Arlington, Virginia, for one week in June 1977. They adopted the following statement of agreements as a means of providing a common base for all those who would undertake the development of the Nationwide Dissemination Configuration. (The recorded vote for adoption was 191 yes, 4 no, 4 not voting.)

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*The word configuration was chosen to coincide with Guba and Clark's use of the term in their paper cited below. The word system was rejected as connoting central control, and network was rejected because of possible confusion with the National Diffusion Network. Egon G. Guba and David L. Clark, The Configuration Perspective: A View of Educational Knowledge Production and Utilization, (Washington, D.C.: Council for Educational Development and Research, November 1974).

**Participant groups included representatives from: ERIC clearinghouse personnel and users; evaluation contractors for major dissemination programs in OE and NIE; National Diffusion Network facilitators and developer/demonstrators; National Institute of Education--Office of the Director and Dissemination and Resources Group; Office of the Assistant Secretary for Education; Office of Education--all major bureaus and regional offices; Research and Development Exchange contractors --selected laboratories and centers; Research and Development Utilization contractors; State dissemination representatives--National Dissemination Leadership Project. No official endorsement from any of these groups should be inferred, however.

Agreement 1: The purposes and outcomes of dissemination activities are many, ranging from acquiring knowledge for its own sake to specific improvements in educational practice. Although the adoption of innovations and changes in practice are possible outcomes, dissemination activities can also lead to decisions to maintain existing practices rather than to change.

Agreement 2: A number of efforts have been made to define the word dissemination. These efforts make it clear that several meanings are possible when the word is used. The Dissemination Analysis Group (DAG), a joint government task force, had delineated four possible usages:

Usage 1 Spread: The one-way casting out of knowledge in all its forms--information, products, ideas and materials--"as though sowing seeds."

Usage 2 Exchange: The two-way or multiway flow of information, products, ideas, and materials as to needs, problems, and potential solutions.

Usage 3 Choice: The facilitation of rational consideration and selection among those ideas, materials, outcomes of research and development, effective educational practices, and other knowledge that can be used for the improvement of education.

Usage 4 Implementation: The facilitation of adoption, adaptation, and installation of improvements.

It is recommended that future usage make clear which, if not all, are denoted.

Agreement 3: The development of a Nationwide Dissemination Configuration can enhance improvements in educational practice. Such a configuration should be open, nonprescriptive, and multipurpose. It should be influenced by all levels of government and by other groups and individuals, and not dominated by any one.

Agreement 4: An effective Nationwide Dissemination Configuration will require a broad, integrated resource base of knowledge. Information about educational research and development, practices, policies, and legal matters should all be available through an ERIC-compatible index and a universally available set of access systems. These resources should be based on the current ERIC system, enlarged to encompass the resources of other eductional information systems and clearinghouses, as well as the addition of new types of data files as appropriate. Quality control of resources should be maintained. Adequate information should be provided so that the users may judge and evaluate these resources for their own purposes.

Agreement 5: Resources should be accessible to and supported by a variety of means and styles of linkage:

a. Continuous efforts to organize and transform the knowledge base into language, format, and styles suitable to a variety of different audiences should be maintained. Particular attention should be paid to the needs of educators, lay persons, policymakers, and especially those individuals that traditionally have not had access to the knowledge base.

b. Human assistance in searching, interpreting, and supporting the use of the knowledge base should be given by providing services that are accessible to users, provide rapid assistance, and are as objective as possible.

c. Human, technical, and financial assistance in implementing knowledge that promises to improve educational efforts should be available, particularly to decisionmaking groups within educational institutions. This assistance should include:

- technical assistance in implementing specific innovations, practices, or products that meet the requirements of users;
- assistance to educational institutions to insure that they gain the capability to use knowledge effectively;
- assistance to lay persons and citizen groups that will provide them with the increased capability to influence educational practice;
- encouragement to those who risk changes in the status quo to undertake activities they believe will improve education.

The styles by which such linkage services are available should be broad and nonprescriptive.

Agreement 6: Dissemination, including the Nationwide Dissemination Configuration, should be an object of study and improvement in its own right.

a. Information about the configuration should be developed and communicated to insure an informed, public process for coordinating the configuration. Particular emphasis should be placed on the development of information about user needs and requirements--both in terms of new knowledge that should be created through research and development and in terms of services needed from the configuration.

b. Specific tools, training programs, and other support efforts should be developed to insure the effective strengthening and growth of the configuration.

c. Research and development on alternative models, theories, and practices of dissemination should be carried out and shared systematically.

Agreement 7: Since the components of the configuration are now, and perhaps always will be, developing, there may be no absolute roles for various agencies, groups, and individuals. In general, however, the configuration should be initiated with these assumptions about functions that should be performed at various levels.

a. A national level function should be to:

- develop a community of interest that will establish goals for the configuration;
- operate those elements that serve nationwide needs;
- provide incentives for a variety of institutions to build their own capacity to operate the configuration within their spheres of activity;
- support research and development on the configuration.

b. A state-level function should be to provide leadership in defining statewide dissemination systems unique to the requirements of each state. The autonomy of states must be carefully preserved, consistent with their constitutional and legal responsibilities.

c. Agencies engaged in direct instruction and those they serve should be the primary beneficiaries of the configuration. The function of the configuration should be to serve their needs with a minimum of constraint upon them. The configuration should not promote change needlessly; instead, it should support efforts to maintain an environment in which students of all ages can learn. The configuration should recognize the contribution that educators make as a source of exemplary practices and information about the effectiveness of other innovations. The autonomy of these agencies and their boards should be respected.

d. Educational laboratories, research centers, universities and colleges, professional associations, independent institutions, individual scholars, and professionals should be encouraged to share and provide their knowledge and services through the configuration and to participate in its study and management. They should be encouraged to build their capability to extend the configuration as well as to provide technical assistance to it.

e. It is recognized that the activities of public and tax-supported agencies are complementary with the activities of the private sector. Functions not adequately provided by the private sector can be undertaken by public and tax-supported agencies in a way that encourages the private sector to be involved to the fullest extent possible.

Agreement 8: Support for such a configuration must be cooperatively shared by all participants and beneficiaries. The development of this configuration will require the expenditure of both fiscal and human energy. These resources are obtainable only through efforts that focus on cooperative and accommodating relationships among participants for the mutual benefit of all.

Agreement 9: The long term vitality of the National Dissemination Configuration is dependent not only on more effective utilization of existing knowledge and resources but also on the continued support for appropriate research and development so as to renew the knowledge base.